Time to accelerate growth

How telcos can fuel growth via 5G and diversification

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Arthur D Little

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Introduction

The "scissor effect" of a widening gap between revenue and investment means that the pressure on telecom companies' cash flow has never been so intense. Left with limited resources to invest into the industry, telecom executives have their backs against the wall, trying to deliver growth while juggling both increasing capex and investor unwillingness to cut back dividends. The COVID-19 pandemic has not helped. As data traffic has soared and for the first time exceeded supply, telecom network upgrades have been high on even governmental agendas. The 2020 edition of our flagship report focuses on a solution to these challenges – unlocking value through asset reconfiguration in order to finance growth and transformation via 5G and diversification.

Our study represents a truly global view, with over 100 C-level interviews conducted between March and September 2020. Our analysis shows that over 90 percent of respondents have considered alternative options to unlock value from network assets. However, it also shows that while most, if not all, telcos have tested the waters of asset reconfiguration, there is incremental value to be extracted as models evolve. In addition, many other questions of value creation remain an executive priority, but are unclear, including ways of monetizing 5G and future value chain positioning of telecom players.

This report proposes means by which telcos can unlock incremental value and reinvest it in high potential growth areas. We hope this will serve as guidance on how to succeed going forward.

5G as an oxygen boost to the economy

With the 5G journey at its start, disruption and innovation will occur in three key value-creating business segments:

- In order to unlock the potential of 5G from a B2C perspective, telco and media companies need to form alliances to create compelling use cases for consumers. It is often not the novelty of the commercial setting, but rather, the added value of the content, experience, or device that creates excitement among consumers. Bundling these three areas and engaging with consumers in a different manner offers opportunities for monetization. We predict that launching 5G premium bundles for content will be the most value-creating option for telcos, and may lead to an enterprise value (EV) increase of more than 10 percent.
- From a B2B perspective, while there is €60bn to be captured in the mobile private networks (MPN) space, competition from non-MNOs is heating up. To compete effectively in this market, telcos will need to provide an end-to-end value proposition, enriching their vendor portfolios and seamlessly integrating various wired and cellular technologies in both an IT and OT environment. Beyond MPN, network slicing represents a substantial opportunity to capture

incremental value. We expect to see both single-tenant and multi-tenant slices, though we suggest that telecom operators initially collaborate with a relatively small set of customers while preparing for others to come: railways, energy and utilities, blue-light organizations and broadcasting companies to begin with, followed by transport & logistics, healthcare, traffic management, drone operations, financial services and others.

- Furthermore, the substantial investment in 5G networks requires telcos to think beyond B2C and B2B business models. A key enabler to tap into further potential value creation is structural separation into ComCos and NetCos. The NetCo can be used as a base to kick-start new wholesale business across multiple 5G models by positioning itself as a neutral infrastructure provider. Such positioning could deliver an overall enterprise value increase of up to 60–75 percent, partly through financial engineering, but mostly due to unlocking new wholesale revenues.

Beyond telcos' core strategy: How to succeed?

Telcos have tried to develop new opportunities beyond their core businesses for decades. While the array of diversification opportunities is vast and players are becoming ever more radical in their efforts, the more important question to resolve in order to create value is ***how*** to diversify. Arthur D. Little's benchmark of telecom diversification initiatives shows that less than 15 percent of initiatives are generating sizable revenue 24 months after launch. Most of the time, revenue contribution of "Beyond Core" initiatives remain highly marginal as telcos are facing multiple internal challenges, which bring down the initial ambition.

To succeed in implementing a successful Beyond Core strategy, a telco should first adopt a "test and fail" mind-set. During the concept selection phase, the Beyond Core team should think in start-up mode and ensure that concepts meet three requirements: they answer a client need with tangible benefits; are aligned with the telco core strategy; and are not immediately replicable by competitors. Once the business potential and telco legitimacy are confirmed, the concept needs to be actioned. Diversifying means that teams will enter unknown territories. Early-stage engagement with potential partners – in particular, disruptive solution providers – provides an opportunity to proof-test concepts, strengthen them, and optimize the utilization of internal resources.

Overall, in order to successfully diversify, the telco needs to follow four priorities: target sizable revenues, but also have a clear growth plan per diversification domain; build a multi-model approach combining internal and external resources (beyond M&A); set up a diversification office structured in private equity mode; and follow a phased and agile approach in execution with sequential prioritization of concepts.

Asset monetization: More than ever, now is the time to reconfigure telco assets

Asset reconfiguration has been accelerating over the last years, with ever more complex models emerging. Reconfiguration has unlocked value for shareholders in multiple ways: securing new funding, increasing consolidated EBITDA and revenues, and increasing overall enterprise value.

TowerCos have spearheaded value creation with multiple benefits – from cash proceeds for the MNO to dynamic development of TowerCo infrastructure assets delivering very high multiple valuations. Looking forward, TowerCos could expand their services in the infrastructure market along several paths, such as entering the active infrastructure layer and expanding horizontally into new asset classes. Beyond TowerCos, telcos are looking towards more comprehensive asset reconfigurations, including legacy fixed networks, mobile radio access networks and edge data centers, as new growth areas.

Telco asset reconfiguration can drive value creation in six ways: accelerating deployment by lifting financing constraints, increased asset utilization, de-risking investment, strengthening the wholesale value proposition, increasing management focus on the distinct core businesses, and possibly preempting unfavorable regulatory decisions. While some of these benefits can be enjoyed through network-sharing agreements or internal governance changes, asset reconfiguration offers a way to capture all these full benefits. However, asset reconfigurations also have their own challenges, and the value creation equation needs to be carefully assessed based on the specific market context of each telco.

Shareholders need to be aware that with NetCo and ComCo reconfigurations, telcos are shifting away from yield stocks to infrastructure rollout stocks and growth stocks. On the one hand, the cash flows of NetCos will need to be isolated to match the investment profile of greenfield infrastructure investments, i.e., massive upfront investment followed by a stable yield over the long term. On the other hand, without a (passive) network, the ComCo will have to justify its capex level and therefore face a choice: become a growth stock or stay a yield stock.

5G as an oxygen boost to the economy

1. 5G B2C: Converging new media ecosystems – opportunities to rethink consumer engagement

Telcos must learn from the past

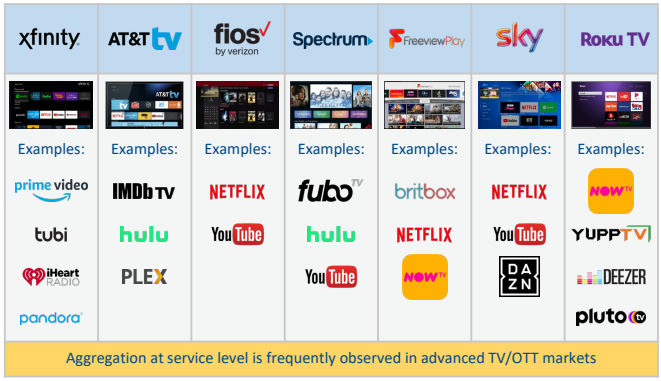
In the early stages of IPTV (mid-2000s), telcos only had a few customers on their platforms and were challenged in licensing content. To increase their customer bases through differentiating content, many telcos, such as BT, Telefonica, Singtel, Telstra and Deutsche Telekom, invested heavily in exclusive licensing and production, including sports and/or own originals.

During the 2010s, most telcos gained substantial market share in TV and video. At the same time, the competition changed. International OTT players' market share grew substantially, with some companies experiencing losses of TV and video customers and/or stagnating ARPUs from content.

With the growing importance of OTT services and increasing bandwidth competition from fixed and mobile networks, telcos needed to review their TV and video strategies. Nowadays, telcos often turn to an aggregator model, i.e., bundling access services (see Figure 1). For many mobile-only operators, the aggregator model has become a viable option to enter the entertainment space, being low risk with an opex-driven investment. For fixed-line operators, with legacy TV and video services under another regulatory regime, managing an aggregator business is more complex. Leaving the approach of aggregation through an APP only aside, the complete integration of third parties into an existing system to provide a seamless customer experience is challenging. Most TV platforms, CRM systems, OSS & BSS systems, middleware, etc., need to be changed or upgraded to onboard third parties, as the existing architecture of most TV platforms wasn't designed for this.

For a telco to become an aggregator, different negotiation skills and new business models are needed. Previous licensing deals based on cost per subscriber and joint marketing initiatives are often no longer applicable or only one part of a deal. For revenue-share models, telcos can't rely on benchmarks from the past, which leaves much room for OTT players to secure good amounts of revenue from such deals. To avoid OTT services partnering becoming a zero-sum game, most telcos subsidize the cost of operations through peering deals, guaranteeing the performance in the networks. Operators often underestimate investments such as technical onboarding, timings, and associated costs in migrating partners to their services. Those costs must become part of the deals that telcos negotiate with OTT players in the same way as joint investments in go-to-market. Conversely, OTT players have limited capabilities and resources, and therefore, focus mainly on operators with high market share and willingness to invest upfront.

Figure 1: Examples of aggregation platforms



Source: Company websites
Note: Britbox aggregation to Freeview is announced but not completed yet

With a plethora of OTT services now available to consumers, telcos need to understand what role in TV and video they can play in the future. Besides being the one-stop shop for entertainment, providing a seamless UI/UX across devices and the convenience of paying one bill, they could invest in individualizing the video offering. This would be based on the intelligence of their networks and analytical capabilities. While moving operations to the cloud, operators can focus more on the services themselves. For example, they can take advantage of specialized software (SaaS) developed for the video domain, such as Wicket Labs (from Seattle), which enables audience lifetime value to be increased, while improving customer acquisition and service engagement and reducing churn. Customer engagement is key to driving uptake and creating stickiness by ensuring that viewers find what they want to watch. For example, Vionlabs (from Sweden) has developed a series of innovative AI engines that use multi-layered, scene-by-scene analysis and other data sources, such as consumers' watch history.

5G could help telcos to avoid a more-for-more approach and being outpaced by global OTT players, which would allow them to instead achieve a user-centric view with customized new products, services, and experiences in the media space. Characteristics of 5G include low latency, high data throughput and improved energy efficiency (see Figure 2). 5G may create a favorable environment for efficient implementation of new media technologies, as well as act as an enabler for an ecosystem of innovation.

Figure 2: Characteristics of 5G

	3G	4GLTE	5G
Deployment	2004-05	2006-10	2019-20
Bandwidth	2mbps	200mbps	>1gbps
Latency	100-500 milliseconds	20-30 milliseconds	<10 milliseconds
Average speed	144kbps	25mbps	200-400mbps

Source: Arthur D. Little analysis

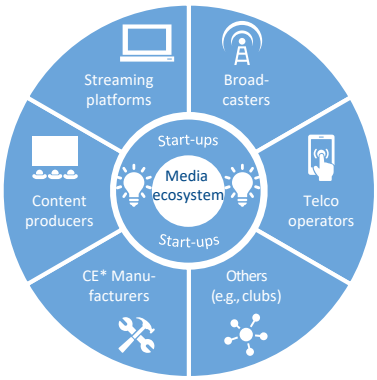
An ecosystem of new-media products and services emerges

Consumers globally are seeking new forms of entertainment, additional content, new user experiences, and cutting-edge technologies. To meet those consumer expectations, different companies, such as content producers (e.g., Disney), consumer electronics manufacturers (e.g., Apple), streaming platforms (e.g., Netflix), broadcasters (e.g., the BBC), and others, have been engaging in the development of features, prototypes and fully fledged new-media products and services. Emerging technologies inspire and open up new opportunities for those players to improve and expand their services or to optimize processes. Partner ecosystems and relationships emerge, grounded in a desire to successfully leverage new media developments, capitalizing on a common objective of bringing new experiences to the consumer.

Telcos are part of this ecosystem and in a prime position of exploring new opportunities (see Figure 3). 5G allows operators to offer new products and services that range well beyond the delivery of their traditional offerings, such as X reality (XR). This leads to a differentiated positioning in the market and creates a greater tangible consumer experience through connectivity and premium content. Media companies, on the other hand, can take advantage of the deployment of 5G networks as well as new devices. They also benefit from the close customer relations that operators enjoy with consumers, thus increasing the popularity of newly developed products and services.

Start-ups are an important source of innovation in media and entertainment. Companies often acquire or partner with them to benefit from new opportunities created through technological

Figure 3: Media ecosystem – player landscape



Source: Arthur D. Little analysis

advancements. The New York Times is, for example, expanding its read-aloud news offering with the acquisition of the text-to-speech voice startup Audm. Apple acquired the VR-content start-up NextVR to ensure it could provide high-quality virtual experiences in connection with its soon-to-be-launched glasses.

Content producers increasingly use artificial intelligence (AI) to optimize their content and marketing spend based on expected audiences. For example, movie studios can use Affectiva's emotional-analytics solution to create different versions of movie trailers based on the reactions of viewers, and Warner Bros is collaborating with the start-up Cinelytic, which uses artificial intelligence to predict the commercial success of films. AI helps content producers significantly reduce costs in production by avoiding manual work, for example, in visual effects. Arraiy's AI-driven production platform can add photorealistic computer-generated images to a movie scene while camera and object are in motion. AI also paves the way for use of augmented/virtual reality (AR/VR) in content production, enabling the creation of immersive experiences. Disney possesses a virtual production system, which allows for real-time visualization of a movie while it's being produced. Disney also uses 3D virtual models based on drone images to visualize production locations. To best leverage the latest technologies, such as 5G, and to capitalize on these new application areas, Disney announced a 5G-related strategic partnership with Verizon. Jamie Voris, CTO of Walt Disney Studios, states: "5G is going to change a lot about our business, everything from how we connect to our production facilities around the world to how we deliver our movies to cinemas."

Consumer electronics manufacturers increasingly concentrate on producing devices that can deliver immersive experiences. For example, there have been large advancements with regards to 3D audio and AR/VR headsets. Sony announced that PlayStation 5 would include a 3D audio engine that could be used with headphones. Apple plans to launch high-resolution (8K) AR/VR glasses, which no longer need to be connected to a computer or mobile phone. Embedding 5G into wearables will

lead to new opportunities for the use of AR/VR glasses such as optimized real-time facial recognition. The use of devices is also becoming more intuitive and engaging due to motion- and voice-based interfaces. The start-up Vicara can add motion control to generic gaming controllers by converting motion data into game actions. Another example is the BBC-produced "The Inspection Chamber", in which audiences can use their Amazon Alexa or Google Home devices to participate with voice control. For all these devices and use cases, high-speed connectivity is required. Qualcomm's latest chip platform features accelerated AI processing and integrated 5G. The chip manufacturer partners with 15 major telcos (such as China Mobile, Deutsche Telekom, LG Uplus, Orange, SK Telecom, SoftBank, Telefonica, Verizon, and Vodafone), smartphone OEMs, and XR viewer manufacturers to create and commercialize XR viewers (see Figure 4). Partnerships are established to collectively provide immersive, never-before-experiences enabled through the operators' 5G networks.

Figure 4: XR Qualcomm ecosystem

Source: Qualcomm

Streaming platforms constantly improve the quality and experience of their services. Currently, the only high-resolution (8K) content-streaming provider is NHK in Japan. To enable 8K streaming, high-speed networks such as fiber, DOCSIS 3.1 and 5G are needed. The WIMI hologram cloud, based on 5G, enables AR+ live streams, displaying holographic videos to audiences without glasses. There has been a shift towards streaming in the gaming industry, with tech giants such as Facebook, Microsoft and Google investing heavily. PlayGiga, recently acquired by Facebook, offers premium video games to players for a monthly subscription. Using Facebook Gaming, players can live-stream their game play on social media. Facebook has also invested in exclusive rights for VR versions of popular games, such as Assassin's Creed and Splinter Cell. Cloud gaming offers big opportunities for telcos, especially with the emergence of VR content requiring high-speed connectivity.

Broadcasters are also increasingly integrating AR/VR features into their programs. For the Tour de France, Danish TV created an interactive table combining AR with real-time data visualization, touch screens and live virtual set graphics. Additional data about athletes can make sport events even more engaging for viewers, for instance, showing the body activity of athletes using millimeter-wave spread-spectrum radar, as demonstrated by Panasonic. Also, 5G broadcasting is gaining in relevance in the industry. In 2019, SK Telecom achieved the first live TV broadcast based on a 5G network; the high-quality video lasted 11 minutes and was streamed with less than a second of latency despite a congested environment. SK Telecom's "T Live Caster solution" enables live broadcasting of videos recorded with smartphones over 5G networks.

As illustrated, telcos are increasingly building partnerships in media and entertainment to showcase innovative uses for 5G, one of which is real-time sports betting. In 2018, sports betting was legalized in several US states. Verizon, in collaboration with the National Football League, installed 5G ultra-wideband networks across several venues for the start of the 2019 season. Another area is event live streaming. Devices connected to 5G Ultra-Wideband networks enabled Disney to integrate red-carpet moments into the premier broadcast of its movie "Star Wars: The Rise of Skywalker". SK Telecom is moving into game streaming together with Microsoft. Gamers can stream Microsoft's Xbox console titles on Android smartphones and tablets over SK Telecom's 5GX Cloud Game service.

British Telecom's (BT's) 5G Edge-XR creates augmented and virtual reality experiences to complement the telco's sports viewing services. It uses cloud computing to stream and display events in real time, requiring uncompromised levels of video and audio display. The customer can use 5G Edge-XR from their smart phone, tablet, television, or an AR/VR headset to watch an event from all angles, realizing the potential of BT's 5G network. One UK media company working behind the scenes for the new BT XR services is Bristol-based Condense Reality. It is a virtual reality start-up that has developed a system for streaming live events through a hologram-style, three-dimensional volumetric video, in parallel with regular broadcast television. This, for example, allows for streaming a sports or entertainment event on external surfaces, such as a coffee table in front of the viewer, while the stream is working in conjunction with the regular television broadcast (see Figure 5).

Figure 5: Hologram-style video from Condense Reality

Source: Condense Reality

Media and entertainment was roughly a €2 trillion industry as of 2020 that constantly brought cutting-edge innovations to market, creating new experiences for consumers. There is an opportunity to multiply the monetization potential by coupling it with other industries and forming partnerships.

The transition to the next generation of media experience has started

5G is a way of bringing next-generation tangible media experiences to life and pushing what was previously unimaginable across sports, entertainment, gaming, and other areas. Telcos are a leading driver in co-creating these new experiences, and by pushing new-media products and services, they can monetize investments in their 5G networks. The way that operators leverage their 5G networks can be grouped into three categories: content, experiences and devices.

To illustrate the potential commercial value of monetizing 5G premium bundles, three models have been constructed using these categories. The value created for operators by introducing 5G premium offerings is estimated in percentage terms for the revenues and enterprise value (EV) of the year of the initiatives' launch and compared to a baseline case (year 0 with no 5G premium offers). Added value is modeled on the assumption that the first 5G premium offering is launched by an incumbent, i.e., no 5G premium offerings currently exist in the market. As more offerings are launched and new technological innovations are introduced, there is a possibility that the underlying dynamics will change.

To quantify commercial opportunities, the models assume a market with 10 million consumers, 140 percent mobile penetration rate, a constant rate of total market expansion of 1 percent, and four operators, each having an equal share of the market. The forecasts do not consider revenue generated indirectly from other areas, only revenue directly attributable to the initiatives.

The main levers of value creation are:

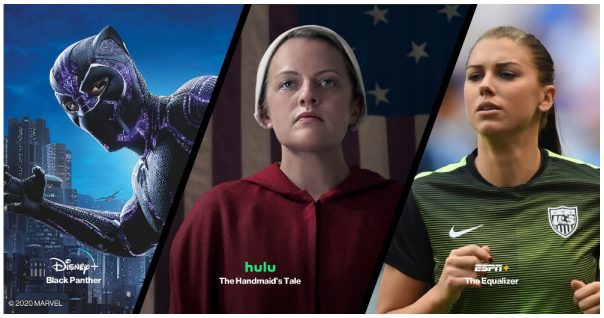
- **ARPU premium:** Extra ARPU generated from 5G premium bundles as a function of revenue sharing, which constitutes the revenues apportioned to the telco from bundling offers with partners.
- **Share of gross additions:** Share of new subscribers for the operator out of total new subscribers.
- **Market churn rates:** Based on data for a market with approximately 10 million consumers, including an assumption of progressively higher churn rates for legacy tech with people gradually shifting to other data plans.
- **Upsell effect from legacy technologies (2G–4G) and 5G to 5G premium:** Bundles are typically offered to higher-paying consumers – which is likely to drive upgrades higher and shift the subscriber distribution between categories.

Exceeding expectations – Creation of celebrated content

There are multiple ways of differentiating via content. These can include having exclusive content (e.g., original entertainment programs), providing new types of entertainment content (e.g., short videos), granting access to or aggregating third-party SVOD platforms etc., any of which can be offered exclusively to customers on 5G plans.

Verizon, for example, partnered with Disney+, Hulu and ESPN, and offered content to its 5G customers in either a "Disney Bundle" or the "Play more and Get More" bundle. The content bundles were added to the unlimited 5G plans for free. Subscribers with 4G/LTE plans can purchase the new entertainment bundles as an add-on, with the first six months free, for an additional monthly fee of around €11. The partnership allows Verizon to offer more media services to its customers and monetize its network investments by upselling 5G data plans and driving uptake.

Figure 6: Disney+, Hulu, and ESPN offering at Verizon



Source: Verizon

Telcos differentiating through content should pay close attention to the financial structure of partnerships, e.g., wholesale arrangements and revenue-sharing agreements, as this has a direct effect on value creation capabilities.

The transactional nature of partnership deals between telcos and players in the media ecosystem can vary. Verizon's bundle of Disney+ was reportedly paid for by Verizon in a wholesale deal arrangement[1] in a similar way to how T-Mobile paid Netflix with a

1 Verizon, 2019, https://www.reuters.com/article/us-verizon-disney-idUSKBN1X11K6

wholesale discount on the price faced by consumers.[2] It is also common to receive an ongoing share of subscription fees when partnering with OTT content providers, with the caveat that fees attributed to operators typically only come from customers signing up for services via the operator's platform.[3]

A key assumption in the model is therefore that partnerships in the content sector will include a cost element, a wholesale fee to the OTT provider that is being offset by increased subscriber growth, revenue sharing, and upselling customers to more expensive data plans. This is substantiated by dynamics arising from historic media bundles – willingness to pay for more expensive telco subscriptions increases.[4] Bundles have also historically had a positive impact on improving subscriber retention, and it's therefore assumed that bundles result in improved churn rates for telcos.[5]

Figure 7: Impact on value creation from bundles in the content category

Revenues % change from bundles
5G with content upsell effect – Legacy tech %

ARPU premium (EUR)	2.50%	3.50%	5.00%	6.50%	7.50%
2.5	3.37%	3.72%	4.24%	4.76%	5.10%
2.7	3.47%	3.82%	4.35%	4.89%	5.24%
3	3.61%	3.98%	4.53%	5.08%	5.45%
3.3	3.75%	4.13%	4.70%	5.28%	5.66%
3.5	3.85%	4.24%	4.82%	5.41%	5.80%

EV % change from bundles
5G with content upsell effect – Legacy tech %

ARPU premium (EUR)	2.50%	3.50%	5.00%	6.50%	7.50%
2.5	7.30%	8.28%	9.75%	11.22%	12.20%
2.7	7.44%	8.44%	9.93%	11.42%	12.41%
3	7.66%	8.67%	10.20%	11.72%	12.73%
3.3	7.88%	8.91%	10.46%	12.02%	13.05%
3.5	8.02%	9.07%	10.64%	12.21%	13.26%

Source: Arthur D. Little analysis

A conservative estimate of an ARPU premium of €2.50 and an upsell of 2.5 percent of the subscriber base from legacy tech indicates extra revenue opportunities of 3.37 percent in total and an increase in EV of more than 7 percent (see Figure 7). If telcos manage to generate high interest in bundles and drive higher upell, the value of a company could increase substantially.

Turning up the volume – Exploration of new-media experiences

Next to content, the user experience is key and can range from simple features that improve handling to immersive experiences or emotional connectivity. High user experience is particularly important in the gaming and esports industry. In gaming and esports, consumers are connected with friends, and even able to measure and display heart rates in augmented/virtual environments, etc.

One example is Sunrise, a Swiss telco, which partnered with the cloud-gaming platform Gamestream to introduce their new 4K gaming platform, exclusive to Sunrise's customers with 5G plans. The gaming app offers a better user experience: it is lag-free, no downloads or local storage are required, it offers low latency and higher bandwidth, and it can be played on multiple devices. If a Sunrise customer does not have a 5G-enabled mobile device, they can purchase the HTC 5G Hub – a mobile hub that delivers 5G speeds for home, business or portable use – as an add-on. The service can only be activated with 5G-enabled devices or played on the TV with the 5G Hub and is only available to Sunrise customers. Customers can sign up to receive the first month free, then the service is €9.18 per month, with no minimum duration. The additional 5G hub can be purchased for €36, as well as an IPEGA Bluetooth gaming controller, if needed, for around €20.

Figure 8: Gamestream offering at Sunrise

Source: Gamestream

Similar to the content model, the experiences model follows the assumption that consumer behaviors will be changed by access to bundles. Also, the structure of commercial agreements between partners is assumed to impact value creation opportunities.

It is assumed that telcos launching bundles in this category will benefit from an increase in revenues but experience a lower boost than from content bundles. The underlying assumption is that it does not, in the short-term, constitute a major driver of revenues, but has positive long-term effects on customer churn and improved brand perception.[6] However, these assumptions are based on current conditions. As offerings improve, consumers could find this new category more attractive – which would make it even more relevant and increasing revenues. Currently, the actual customer base for paid experiences, including gaming, is assumed to be lower than for content. The lower relative popularity for experiences implies that the number of subscribers to upsell is lower. Nonetheless, there is a presumed mitigating effect of an expected increase in data usage per subscriber, which will likely drive upgrades a little higher. All things considered, the model incorporates an ARPU premium and user adoption of 5G experiences that is slightly lower than for content.

2 T-Mobile, 2017, https://www.reuters.com/article/us-t-mobile-us-netflix-idUSKCN1BH25N
3 Telecomlead, https://www.telecomlead.com/telecom-services/telecoms-entertain-netflix-boost-arpu-67309
4 Amdocs, 2020, https://www.amdocs.com/sites/default/files/Ovum-OTT-market-study-2019-20.pdf
5 Nasdaq, 2020, https://www.nasdaq.com/articles/verizon-is-giving-disneys-streaming-a-boost-2020-08-24
6 PWC, 2020, https://www.strategyand.pwc.com/m1/en/reports/2020/skin-in-the-game/skin-in-the-game.pdf

Figure 9: Impact on value creation from bundles in the experiences category

Revenues % change from bundles
5G with experiences upsell effect – Legacy tech %

ARPU premium (EUR)	0.50%	1.50%	3.00%	4.50%	5.50%
1.5	1.37%	1.67%	2.13%	2.58%	2.88%
1.7	1.42%	1.73%	2.19%	2.66%	2.97%
2	1.48%	1.80%	2.29%	2.77%	3.10%
2.3	1.54%	1.88%	2.38%	2.89%	3.23%
2.5	1.59%	1.93%	2.45%	2.97%	3.31%

EV % change from bundles
5G with experiences upsell effect – Legacy tech %

ARPU premium (EUR)	0.50%	1.50%	3.00%	4.50%	5.50%
1.5	2.83%	3.75%	5.12%	6.49%	7.40%
1.7	2.90%	3.83%	5.22%	6.61%	7.53%
2	3.00%	3.94%	5.37%	6.79%	7.73%
2.3	3.10%	4.06%	5.51%	6.96%	7.93%
2.5	3.16%	4.14%	5.61%	7.08%	8.06%

Source: Arthur D. Little analysis

Value creation in the experiences category is affected by the ability to generate an upsell effect from legacy tech, underscored with EV accretion of approximately 8 percent when the ARPU premium generated is equal to the base-value estimate of €2 (see Figure 9).

Leading the excitement – A discovery of possibilities through new-media devices

Devices that lead to new-media products and services, enabling the customer to have a tangible experience while leveraging the operator's 5G network, include body wearables such as watches or monitors, VR headsets, and AR glasses.

For example, Korea's LG Uplus has partnered with China's mixed-reality product developer and start-up, Nreal, to create the world's first 5G-enabled AR glasses (see Figure 10). These glasses are exclusive to LG Uplus customers with 5G data plans. The glasses are connected to a user's smartphone via USB and can display entertainment content as wide as 2.5 meters. A 3D system called Nebula is incorporated into the glasses, whose core function is to convert the traditional 2D media entertainment and web browsing to a user-defined 3D interface. With this function, multiple applications can be projected at once, e.g., users can watch shows in 3D while browsing the internet simultaneously, which creates an entirely unique user experience. The stand-alone price is approximately €500. Alternatively, LG Uplus has offered to bundle the glasses with the Galaxy Note 20 or the LG Velvet with a 5G data plan for €250.

Figure 10: 5G-enabled AR glasses of LG Uplus

Source: Photo by LG Uplus Corp.

Appealing 5G devices have been developed for consumers, and the core assumption of the financial model is that initiatives with devices will create additional value for telcos. However, the cost to telcos of subsidizing devices, along with limited content,[7] will probably have a negative impact at present. In the short term, it will presumably cap potential revenues and thus limit the ability to generate additional ARPU. Consequently, the user adoption of 5G device offerings is estimated to be lower, on a comparative basis, than for content and experience bundles.

Figure 11: Impact on value creation from bundles in the devices category

Revenues % change from bundles
5G with devices upsell effect – Legacy tech %

Cost of discount (EUR)	0.50%	1.50%	3.00%	4.50%	5.50%
25	1.11%	1.34%	1.70%	2.05%	2.28%
35	1.11%	1.34%	1.70%	2.05%	2.28%
50	1.11%	1.34%	1.70%	2.05%	2.28%
65	1.11%	1.34%	1.70%	2.05%	2.28%
75	1.11%	1.34%	1.70%	2.05%	2.28%

EV % change from bundles
5G with devices upsell effect – Legacy tech %

Cost of discount (EUR)	0.50%	1.50%	3.00%	4.50%	5.50%
25	0.76%	1.23%	1.92%	2.61%	3.08%
35	0.12%	0.44%	0.92%	1.41%	1.73%
50	-0.85%	-0.74%	-0.57%	-0.40%	-0.29%
65	-1.82%	-1.92%	-2.07%	-2.22%	-2.31%
75	-2.47%	-2.71%	-3.06%	-3.42%	-3.66%

Source: Arthur D. Little analysis

As a result of not generating any additional ARPU or ARPU premium, an additional key variable in this category is the discount on the device, which the telco carries as a cost. This translates into restricted ability to create value for the telco. A high cost (>€35) of bundling implies that, even if upselling occurs, it is not enough to offset the negative effect on value creation (see Figure 11). To boost added value, a lower cost of discount on the device ought to be coupled with a progressively higher upsell effect.

Besides the examples mentioned above, there are multiple use cases that have the potential to be monetized in the future. Examples include B2C use cases that are not yet monetized but have marketing purposes, and those that are currently B2B but can translate to B2B2C.

There are various start-ups, such as Dimension, a company that creates mixed-reality content for larger firms. Dimension's volumetric studios allow for the creation of next-generation XR content, virtual production and digital humans, such as holograms. Dimension has collaborated with telco operators and broadcasters on various projects to bring this next-generation content to life. For example, Dimension collaborated with SK Telecom and Nexus to create realistic AR content of the King and Queen of the Joseon Dynasty for the reopening of the Changdeok Palace, a UNESCO World Heritage site. Efforts such as this B2B project have the potential to bring immersive content to life and eventually become a B2C product or service.

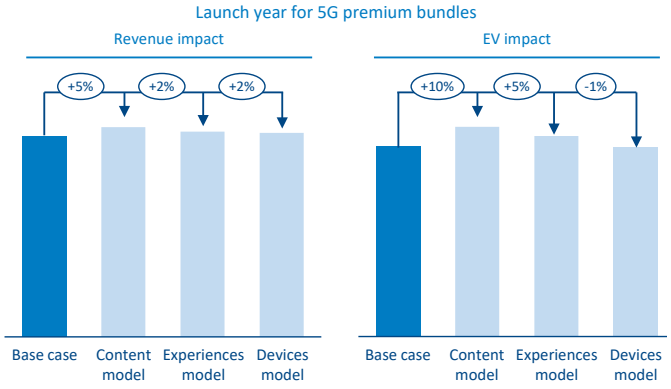
7 PWC, 2018, https://www.pwc.co.uk/intelligent-digital/vr/growing-vr-ar-companies-in-the-uk.pdf

Strike deals, differentiate, monetize investments and shape the market

Telco and media ecosystem partnerships, which create and provide new-media products and services, play an instrumental role in maintaining competitive advantage. Operators must rise to the innovation challenge of creating greater immersive and tangible experiences.

Based on the high-level quantifications outlined previously, launching 5G premium bundles for content is the most attractive. This is due to its ability to attain the highest boost in EV, considering current conditions (see Figure 12). This is primarily attributed to a comparatively higher predicted ARPU and higher upsell effect from legacy tech based on current market conditions. However, in line with new innovations and market developments over time, the relative attractiveness of each category could potentially change.

Figure 12: Impact on revenues and EV in each of the three categories in the launch year



Source: Arthur D. Little analysis

5G premium bundles for experiences would improve the value of a telco by 5.37 percent, simply by keeping the ARPU premium and percentage of upgrades from legacy tech at estimated base values (see Figure 13). EV accretion for telco propositions with 5G devices is primarily dependent on a telco's ability to maintain a low cost for the discount on the device. In other words, bundles of 5G devices can potentially generate added value for a telco with only a few customers upgrading if the discount is not too high. Positive indirect effects of 5G premium bundles are not included in the models, and initiatives could also have positive long-term effects. This includes consumer churn and improved brand image, and as such, the models might not capture the full long-term commercial value of premium initiatives.

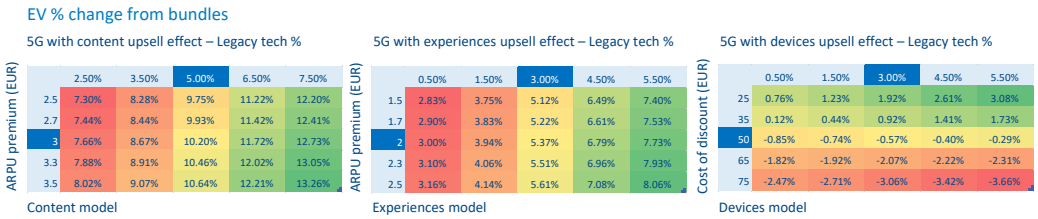
Bundles across categories could also improve the value generated, particularly as initiatives are seemingly driven by a desire to differentiate rather than gain short-term incremental revenue. The experience and device propositions could, for example, be part of combined bundling offers to the gaming segment. Combined bundles could potentially both offset the reduction in EV for devices and help telcos differentiate themselves from the competition.

Given the different possible scenarios, there is a clear objective to having a commercial strategy in place and defining how to address the increasing customer expectations for new-media services and products, leveraging the next generation of mobile technology and monetizing investments.

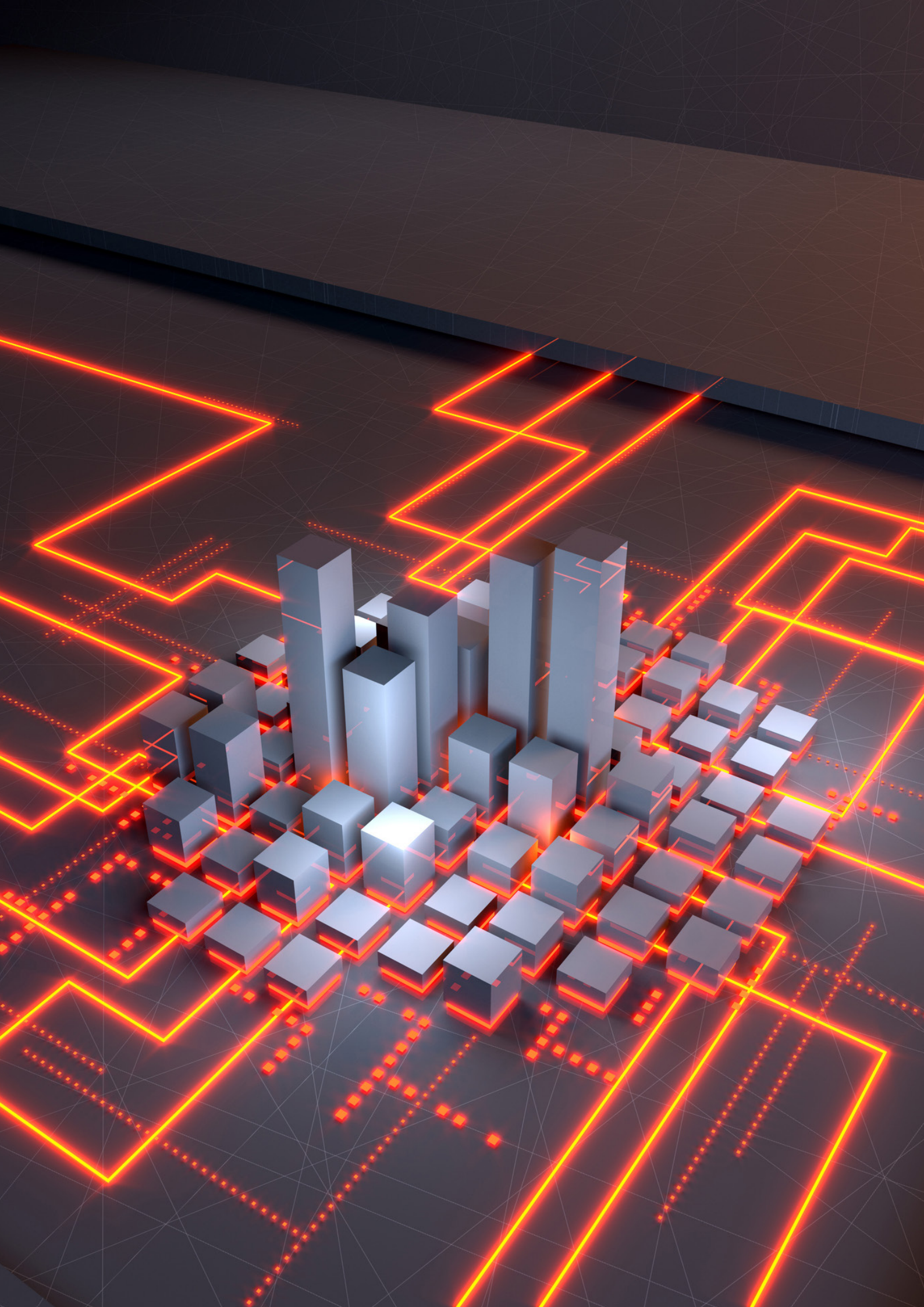
5G offers opportunities for telcos to rethink how they can engage with consumers through content, experiences and devices, and how they can monetize bundles of these offerings. More personalized services require more commercial flexibility from content partners, an emphasis on technology enhancements, analytics, and a strong focus on customer experience.

The name of the game is the formation of ecosystems from which (exclusive) partnerships can be formed, giving telcos the opportunity to create notably differentiated offers and providing unique value to the customer that ranges well beyond the delivery of telcos' traditional offerings. 5G is still in its infancy and new use cases will continue to create additional commercial opportunities for telcos and partners to capitalize on.

Figure 13: Impact on EV from bundles in each category



Source: Arthur D. Little analysis



2. 5G B2B: Mobile private networks – the €60bn B2B opportunity

Mobile private networks are gaining strategic importance – Enterprises are experimenting globally

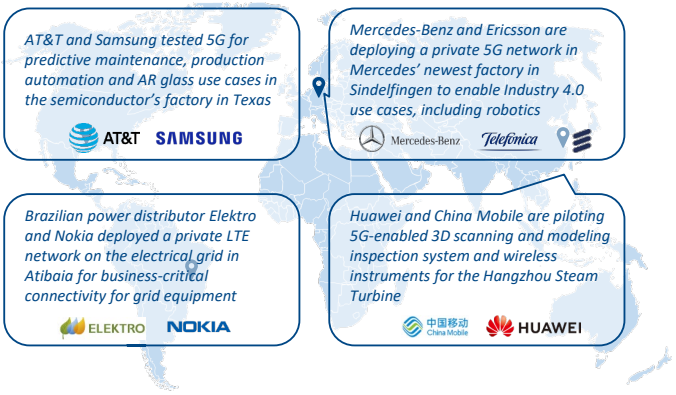
Connectivity has been a key enabler of digitalization for the last decades. Specifically, at the industrial campus (defined as enterprise-controlled localized environment), connectivity has been historically ensured via fixed networks, e.g., connecting office devices via Ethernet. With the trend towards more mobile work processes, WiFi has since become the technology of choice, replacing large parts of the fixed infrastructure.

Yet despite the boom in digitalization – and the rapid increase in required network bandwidth, latency, and security – the existing fixed and WiFi networks have lacked efficacy and efficiency. In parallel, mobile technology for enterprise use based on 4G/5G has matured significantly and met those requirements. This has led the way to a new generation of MPNs.

Significant new demand for connectivity in industries and sectors previously regarded as only requiring bare-minimum communication infrastructure is driving global adoption of MPNs. Car plants, mines, stadiums and airports have become the digital enterprise playground of today and tomorrow.

MPNs have been on the rise on a global level

Figure 14: Selected MPN case studies



Source: Arthur D. Little analysis

Figure 15: Overview of MPN spectrum availability

USA	■ 3.5 GHz CBRS, exclusive & shared licenses, deployments 2H19 ■ 37–37.6 GHz shared spectrum/local licenses, under evaluation
Germany	■ 3.7–3.8 GHz ■ 24.25–27.5 GHz, local licenses, under consultation ■ Local licenses. Assignment complete, available 2H19
UK	■ 3.8–4.2 GHz ■ 24.25–26.5 GHz, local licenses, application open since end '19 ■ Local licenses. (50m2), regulator DB, applications from end '19
Sweden	■ 3.72–3.8 GHz in consultations
Finland	■ Sub-licensing of 3.4–3.8 GHz ■ Local permissions via operator lease, assignment complete
Netherlands	■ 3.5 GHz for local industry use; 3.7–3.8 GHz in consultations; 2.3–2.4 GHz (licensed shared access online booking system) ■ Users may need to move 3.7–3.8 GHz if allocated; 2.3 GHz appr.
France	■ 2.6 GHz, regulator database & approval, up to 40 MHz approved for professional mobile radio
Czech Rep.	■ 3.4–3.44 GHz for private networks
Italy	■ No dedicated vertical spectrum
Brazil	■ 3.7–3.8 GHz CBRS, under consultation ■ 27.5–27.9 GHz allocation completed
Chile	■ 3.75–3.8 GHz allocation completed end of 2019
Australia	■ 24.25 – 27.5 GHz and 27.5 – 29.5 GHz for final consultation in 1H20
New Zealand	■ Licenses in 2,575–2,620 MHz may be assigned for localized use
Malaysia	■ 26.5–28.1 GHz will be assigned for the deployment of local/private networks
Singapore	■ Each operator will be allowed to acquire 800 MHz of 26/28 GHz spectrum to deploy local networks
Hong Kong	■ 24.25–28.35 (400 MHz), local license, regulator approval, approved, available 3Q19
Japan	■ Phase 1: 2,575–2,595 MHz (NSA anchor) & 28.2–28.3 GHZ local licenses, legislated in December 2019 ■ Phase 2: 1888.5–1916.6 MHz, 3.6-4.9 GHz & 28.3–29.1 GHz local license, consultation 3Q20
Spain	■ No dedicated vertical spectrum

Source: Arthur D. Little analysis

The boom in MPNs has been further supported by a "spectrum liberalization" in selective markets. Radio frequency spectrum is a key component of providing mobile connectivity – and it has been heavily regulated and off the table for enterprise users in previous decades. In those jurisdictions where a concerted spectrum de-regulation push has occurred, the number of MPNs has grown even more. Figure 15 below provides an overview of key markets where spectrum was made available directly within verticals.

For example, in Germany, frequency deregulation led to 74 new local frequency licenses in the first 10 months of 2020

Connectivity-only is not enough; a managed end-to-end value proposition is required

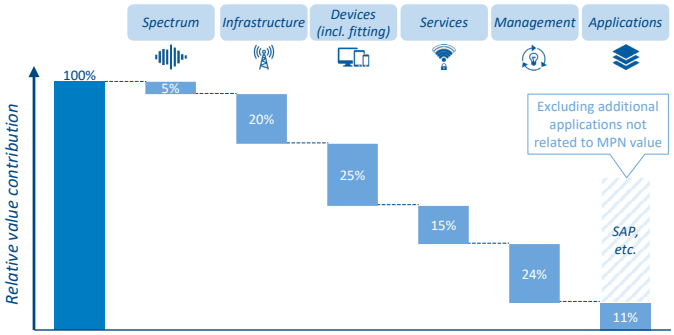
To fully enjoy the value of an MPN, the customer set-up is significantly more complex than just network infrastructure. It consists of an ecosystem of end devices, services and applications that enable end-to-end digitalization.

From a provider perspective, an MPN value chain consists of the following elements:

- **Spectrum** – A licensed slice of national spectrum (e.g., 3.5 GHz band in selective European countries) or an unlicensed frequency (e.g., CBRS in the US).
- **Infrastructure** – Radio access network (e.g., RRU/AAU, macro/micro/small cells, access points, BBU), core (e.g., EPC, 5GC), transport (e.g., fiber), data center.
- **Devices** – Handsets, tablets, sensors.
- **Services** – Voice and data (telco connectivity), computing, storage, security.
- **Management** – User and device management, network management & configuration, security management.
- **Applications** – IoT platform, enterprise applications (e.g., ERP, CRM), security solutions (e.g., firewall), SD-WAN, SaaS.

Figure 16 outlines the value distribution of those MPN elements in a typical network set-up.

Figure 16: Value distribution across domains in an MPN set-up

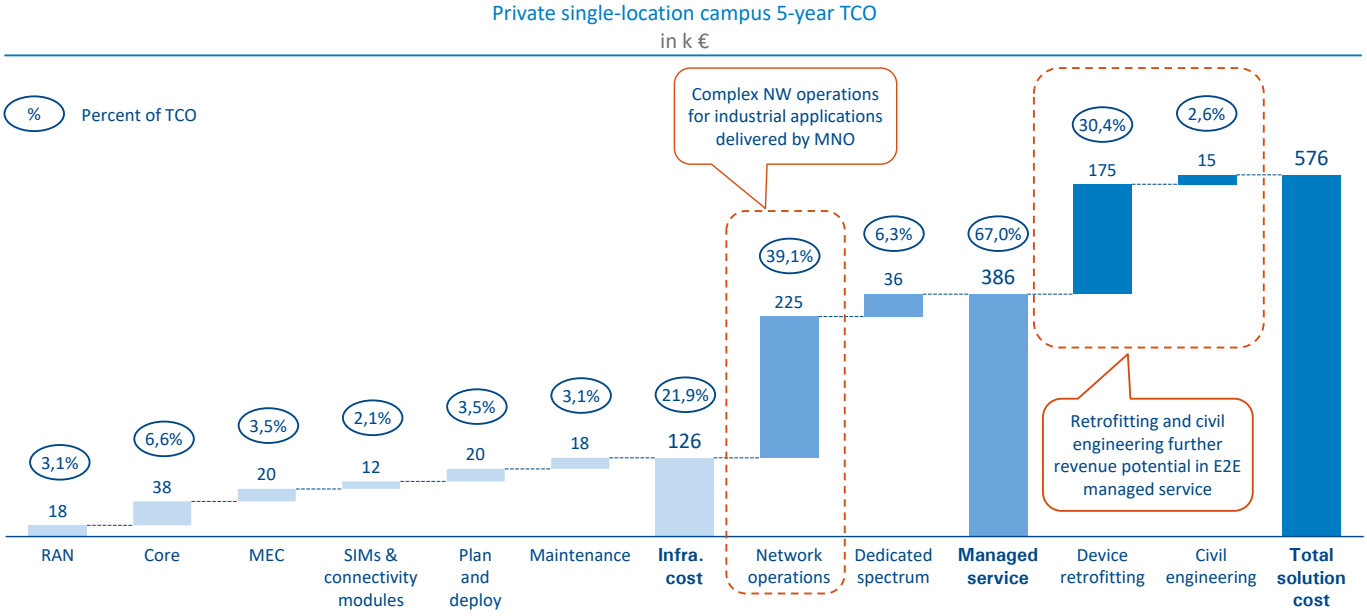


Source: Arthur D. Little analysis

Regulated spectrum is still reserved for telcos in many jurisdictions and poses significant differentiation

Whereas hardware and implementation – infrastructure and devices – contribute less than half of the overall market value (45 percent), the "soft" part of an MPN – services, management and applications built on top of the hardware – contributes 50 percent of the value in a typical set-up. This provides a huge opportunity for operators as well as system integrators.

Figure 17: Illustrative five-year TCO calculation of an MPN



Source: Arthur D. Little analysis

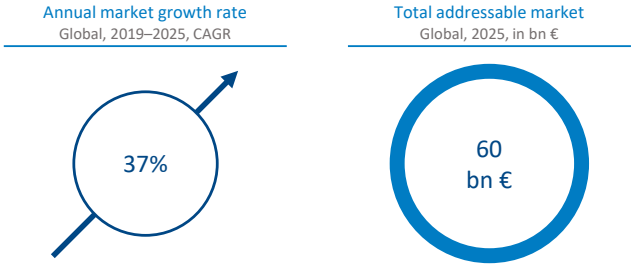
MPNs will become a €60bn market by 2025 on the back of industrial digitalization

To understand how this value distribution translates in absolute terms to a network cost profile from a customer perspective, we have taken a closer look at an illustrative campus network implementation.

We have designed an exemplary network set-up (see Figure 17). This small-scale network for a production plant enables IoT use cases with ~60,000 sensors. This network was delivered at a full five-year cost of €576,000.

Globally, we estimate that the total addressable market size for MPNs in the OECD will grow by ~17% p.a., reaching €60bn in 2025. This encompasses both the implementation of the network and its running, including aforementioned services and operations.

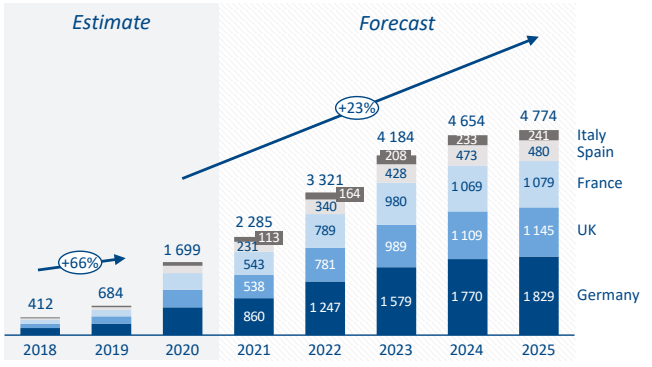
Figure 18: MPN global market size



Source: Arthur D. Little analysis

Furthermore, a granular demand-side study shows that market potential depends greatly on the scale of industrialization and the digitalization drivers in the economy. We have analyzed selected countries in detail – France, Germany, Spain, the UK and Italy (together representing around 8 percent of global telco spend) – which all score high on the above criteria. These markets will grow from ~€700mn in 2019 to more than €4.5bn in 2025, above the OECD average at 23 percent p.a.

Figure 19: MPN market size in key European markets



Source: Arthur D. Little analysis

MPNs will grow rapidly in 2021/22, mostly due to EU-wide deregulation of spectrum and maturing digitalization use cases

Non-MNOs are stepping up their game, creating a more competitive environment

We note a variety of MPN market players, each with their unique business focus, strengths and weaknesses (see Figure 20).

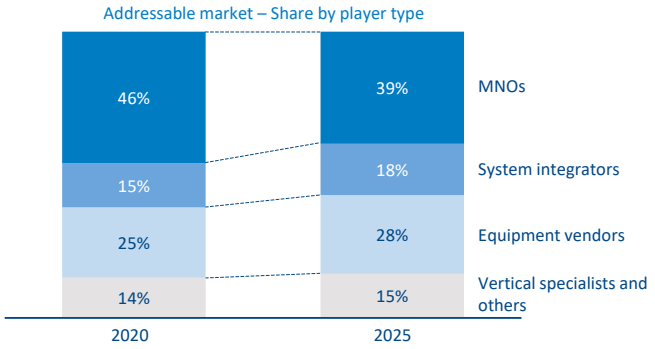
Figure 20: Overview of MPN market player types

	Key strength	Improvement potential
MNOs	■ Own spectrum ■ Equipment provider agreements ■ Network operations experience	■ Not always used to small-scale implementations and cost profile of private networks
System integrators	■ Provider-agnostic offering ■ E2E implementation capabilities	■ Lack of focused value proposition ■ Lack of capabilities in network operations
Network equipment providers (NEPs)	■ Turnkey network offering	■ High-cost profile ■ Little support of open-access concepts
Vertical specialists	■ Specialized offering, including apps and services	■ Narrow offering
WiFi providers	■ Experienced in the set-up of connectivity layers for verticals	■ Limited references with cellular 4G/5G technologies

Source: Arthur D. Little analysis

However, few players have developed a strategic approach and tailored value propositions to seize the MPN opportunity. MNOs currently display the most business development efforts and arguably the most involvement in existing MPN projects.

Figure 21: MPN addressable market by player



Source: Arthur D. Little analysis

MNOs' potential market in 2021 is close to half of the full value chain for MPNs (46 percent), but this is expected to steadily decrease to ~39 percent by 2025 as players in other telco areas enter the market.

Telcos need targeted value propositions for MPNs, as well as offensive and defensive market positioning strategies

Industrial digitalization is becoming more complex – where and when does 5G make sense?

Connectivity has always been a key infrastructure component – however, companies' reasons for using MPNs have changed over time. In the past, a key goal has been to connect IT devices, mostly in an office context; today, the focus of industrial players has moved to connecting production machines, sensors, etc., to monitor and control production processes.

Operational technology is where value potential lies – IoT-based control and monitoring brings significant benefits, and industrial players are ready to invest proportionally to build the required infrastructure. However, integration with the classic IT landscape is critical to harvest the full potential. IT and OT silos need to be broken down to enable end-to-end digital use cases. Industrial players aim to support their digitalization roadmaps with a variety of connectivity solutions.

We have clustered those use cases in terms of their connectivity requirements:

- **eMBB** (enhanced mobile broadband) – For use cases that center around broadband connectivity (high throughput) with non-critical latency and reliability requirements. Examples include video streaming, inventory management and cloud-based maintenance applications.
- **uRLLC** (ultra-reliable low latency communications) – Throughput, latency and system availability are the key requirements of these use-cases clusters. For production- or safety-critical applications such as AR/VR support and automated vehicles (AGVs).
- **mMTC** (massive machine type communications) – For use cases that require high device density (i.e., high number of sensors), but low throughput and latency. Examples include production-line monitoring and smart logistics.

Beyond these horizontal use cases (applicable to a range of industries and sectors), a variety of tailored vertical solutions are being developed.

We expect adoption to be driven first by broader, horizontal use cases, which are suitable for growth and scaling

The connectivity requirements of these use cases vary greatly. Use cases with low network requirements can be easily enabled by private LTE networks. However, with increasing use-case complexity moving forward, the connectivity requirements will increase exponentially, nearing the limit of LTE technology. Examples include uRLLC AR/VR-based use cases and AGVs, which require throughput rates and ultra-low latency that can only be achieved with 5G.

Figure 22: MPN use-case requirements

Use case demanding…	High-throughput UCs (eMBB)	Business-critical UCs (each match weighs 1/13th) (cMTC)	High-device-density UCs (each match weighs 1/10th) (mMTC)
Coverage area	n/a	n/a	Concentrated area
Device density	<30/sector	<100/sector	>100/sector
Coverage per AP	Not relevant	Small area, redundant coverage	< 200 m2
Handover	Seamless not needed, packet loss OK	Seamless & redundant, packet loss NOK	n/a
Encryption	n/a	Client key management	n/a
Authentication/Authorization	n/a	Integrated	Integrated
Traffic shaping	Prioritization	Non-blocking	Non-blocking
Delay incl. application/RTT	<500ms/<70ms	<20ms/<10ms	<500ms/<10ms
SLA penalty (e.g., days p.a. w/SLA violation)	Minimal	High, specific penalization (also beyond service fee)	n/a
Managed service	n/a	Always part of it	n/a
Single UC or portfolio of UCs	Non-specified or portfolio	Defined UCs	Roadmap of UCs
Uniform across multiple facilities	No specific need	Uniformity less relevant than UC fit	Uniformity needed
Guaranteed/allocated spectrum	Unlicensed OK	Guaranteed spectrum needed	Guaranteed spectrum needed
Connectivity integrated with UC	No UC integration	UC integrated	UC integrated

Source: Arthur D. Little analysis

Building and running an MPN often go hand in hand

From a customer perspective, a core question is who should build and operate the MPN, and how this should be achieved. We have noted four key scenarios regarding the sourcing and operating model:

- **As-a-service** – The provider builds an MPN for an end customer, including a managed service, with assets remaining in control of the provider – operator revenue models are often based on fixed feeds; newer models also target risk/benefits sharing.
- **Build-operate-transfer** – The provider builds and operates the MPN; assets are, however, transferred to the end customer – fixed-service fee revenue models prevailing.
- **Design-to-manage** – The provider designs an MPN and supplies requirements to the end customer, who builds to provider's specs; the provider operates the network – no clear revenue models have emerged as risk transfer is central to this model.
- **In-house** – The end customer leads the design and build of an MPN, procuring the necessary components and support from providers, retaining control of assets and operating the network.

Most industrial players view connectivity infrastructure as outside their comfort zones and typically aim to outsource. There are a few exceptions, notably large industrial players with heavily digitalized multi-campus set-ups that view factory connectivity as a differentiator and thus aim to build in-house capabilities.

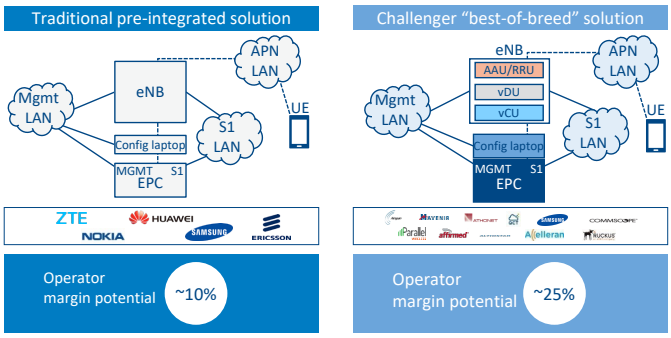
The "as-a-service" and "build-operate-transfer" models are enjoying growing customer demand

There are two archetypical solutions for deploying an MPN in a broader sense:

- **Traditional pre-integrated solution** – A turnkey network package, sourced from a single end-to-end vendor; offered by a global network equipment provider.
- **Challenger "best of breed" solution** – Virtualized/open access-based network solution with components sourced potentially from multiple challenger vendors.

Equipment-only cost profile of the pre-integrated solution is significantly higher than the "best-of-breed" – and therefore leaves less potential margin for the operator/e2e provider. For large industrial clients, pre-integrated solutions combined with carrier-grade equipment packages can be, however, a feasible solution due to higher network requirements.

Figure 23: MPN vendor solution comparison



Source: Arthur D. Little analysis

How to succeed in the MPN space

The market for MPN and its underlying technologies is entering maturity. The business value is set to reach €60bn by 2025, growing at 37 percent p.a. Yet, especially in markets where spectrum is directly allocated to verticals, operators face stiff competition from many directions.

For an initiative to be successful, key ingredients need to be in place – subsequently, a clear and targeted strategy should be defined:

- **Extend capabilities beyond core** – The ultimate winners in MPN will be those players that can seamlessly integrate various wired and cellular technologies in both an IT and OT environment.
- **Enrich the vendor portfolio** – MPNs across verticals differ widely in terms of requirements and target cost profiles. Operators need to onboard specialized MPN vendors to effectively address customer requirements. These are often not the NEPs used in public network set-ups.
- **Innovate business models** – In the MPN space, operators will be in direct competition with their traditional suppliers (where spectrum is available within verticals). To win, telcos need to adapt business models to encompass more innovative G2M models such as capex financing or "design-to-manage" models.
- **Empower the B2B organization** – Successful MPN implementations require the coming-together of various functions within the operator. The B2B organization must therefore be empowered to act as the driving force in the space. This includes access to people, as well as a clear ring-fencing of deployment capex.

3. 5G B2B: The high-value opportunity of network slicing

Delineation of slicing in the context of this report

Slicing describes a method of isolating and dedicating network resources (such as spectrum, networking software and the related servers) in a public-wide area network for a singular customer, application, or scope.

To describe the business benefits of slicing as opposed to using a public wide-area network, we need to understand how network quality is described. The categories are:

- **Performance:** Throughput, packet loss, jitter, latency, etc.
- **Availability:** Uptime, mean-time-between-failures, repair times, spare-parts stock and longevity, expert accessibility and timeliness, etc.
- **Manageability:** Visibility of network performance, ease and speed of configuration, essentially the software solution that steers the network, maintenance schedule and process, etc.
- **Automation:** Interfaces that enable a client application to interact with/control the network in both directions (e.g., network to application and application to network), etc.
- **Security:** Authentication and authorization mechanisms, encryption on all levels, and key handling, etc.
- **Scalability:** Method and speed with which network resources can be made available in different capacities, locations and to different devices, etc.

Figure 24: Advantages of network slicing

Advantage of network slicing	
Performance	Performance characteristics are isolated from any other users of the network. Congestion in the public part of the network due to shortages in spectrum, network equipment capability, backhaul capacity, etc., will not impact the slice
Availability	Availability is slightly improved if separate redundancy concepts can be implemented
Manageability	Network performance is highly transparent to the user – for each part of the network
Automation	Network automation, if existent, can be made available
Security	A distinct and separate security concept is possible
Scalability	The ability to scale slices depends on the specific operator's capacity

Source: Arthur D. Little analysis

A slice could be viewed as a layer 2 VPN with mobile end points and isolated capacity on each networking device. While this is easy to do in wireline networks, it was previously not possible in cellular networks. Prioritization and class of service were introduced in 3G, but resources could only be prioritized one over the other, not isolated – if the network is busy, it is busy for all resources.

By isolating network resources from the public network, a slice enables operators to publish and manage service parameters and quality for a single use case, client or application.

This enables the close integration of the specific business objectives with the capabilities of a network service provider – and thus allows the network service provider to tap into new fields of value.

The slices we will see

We want to assess slicing from a business perspective, so we exclude slices used to manage/shape traffic in public or private networks for the benefit of the operator's network economics. We also exclude slices that exist only in the context of campuses. We exclude the latter because while these are private networks that can be realized or optimized via a slice, they are not in the same market as the wide-area slices. We also exclude "hybrid slices", i.e., slices that are in the wide area but reach into the private area. This differentiation allows us to delineate two market segments, each with distinct, non-overlapping value creation potential.

Beyond these limitations, in the near term, we expect to see only a few slices in each market. Other commentators have written about a plethora of slices, but we believe technical complexity and costs will outweigh many of the slicing ideas – at least in the beginning.

We expect dedicated slices for single organizations, but also multi-tenant slices. In fact, it seems certain that multi-tenant slices will prevail as a business model since many of the use cases described below may be served by one player for multiple players of the same type. Think of a railway slice as a single

slice provided by a rail/infrastructure/public provider but used by multiple train operators. Or consider a "blue light" slice that may be used by multiple blue light organizations. The same may be true for emerging slices that we list in the "other" box below: a transport slice for multiple logistics companies or a drone slice used for multiple drone-operating players, etc. This may be the prevailing model – and underpins our thinking that there will only be a few slices in each market initially.

We have seen – at least – four immediate slicing candidates, plus a small number of other future slice customers emerging:

Figure 25: Slicing customers

Source: Arthur D. Little analysis

Railways

Railway organizations are driven by four business objectives: safety, punctuality, capacity, and efficiency. There are many digital use cases that improve these objectives, including maintenance, tracking, surveillance, digital interlocking, the European Federal Railway Management Communication System (FRMCS) and many more. We believe the most pressing one is autonomous train driving, including teleoperated trains. It is pressing for multiple reasons: on the one hand, a shortage of train drivers is foreseeable, while overall passenger and train numbers will increase. On the other hand, universal service obligations force national train organizations to also target non-profitable areas in which cost pressures are high. Caught in this dilemma, railway organizations need to find a path towards autonomous trains.

Self-driving trains cannot rely on onboard intelligence only, as systems require coordination from a higher level. 5G is a natural candidate, but a public 5G network clearly cannot be used for autonomous trains. Multiple railway organizations have considered deploying their own 5G networks alongside their tracks, with some even ready to build two redundant networks. However, a better approach would be a 5G slice.

This 5G slice has to be ultra-reliable – to the extent that the provider of such a slice needs to commit to significant penalties in case of network glitches. This includes railway operators demanding that communication service providers carry the financial risks associated with passenger injury or worse. This risk-carrying capacity will be priced into any commercial arrangement and most likely, also be insured against. Some rail operators – obliged by law or otherwise – want to go beyond the provision of a guaranteed managed service: they also demand equity ownership of the solution's safety elements, including the 5G network and related assets. In such cases, even joint ventures may need to be set up.

As a result, it is unavoidable that technical and commercial solutions will be subject to a high-risk premium.

Utilities

Utilities are driven by three main business objectives: effectiveness, efficiency and "green-ness". Use cases thus involve effectiveness in exploration, maintenance scheduling, efficiency in development, production, operation and transport of raw materials and energy, etc. We believe the most pressing use cases are in the area of maintenance and remote operation – upstream, midstream and downstream.

As utilities progress beyond early, non-production-relevant use cases (e.g., condition monitoring) to production-relevant use cases (e.g., remote operation, health and safety monitoring, or condition-based maintenance), the need for a wide-area network capable of carrying critical data becomes apparent. This is even more the case once communication failures could lead to both production interruptions and infrastructure damage – for instance, if the balance fails between distributed systems of power generators and consumers.

Here again, there are significant issues requiring risk absorption and technical design, as well as isolated network capacities and capabilities, which telecom operators could aim to monetize.

Blue light organizations

Blue light organizations are at a crossroads, as old technologies such as Tetra-based push-to-talk (PTT) fades away while new data-driven use cases begin to emerge.

Police officers need secure datalinks to their central data repositories while on the road, supported by situational awareness abilities (facial recognition, traffic reports, car registrations, etc.). WiFi hotspots clearly aren't sufficient for this purpose.

For emergency services such as fire fighters, situational awareness is often life critical, for instance, during wildfires. With 5G, drones can be deployed to provide situational awareness and seek humans in large catastrophe areas. Or patient records

can be accessed, and diagnostic data transmitted to hospitals while emergency services are en route.

Given the limitations of legacy technologies in use today, the fundamental question is: what can blue light network operators do once current technologies are no longer supported? Options include building their own 5G networks, purchasing 5G capacity on a wholesale basis and operating in a public network, or obtaining slices with dedicated capacity.

Slices are a valid option, assuming commercial terms are sensible. Such slices justify themselves not only by providing ultra-high availability, but also because of the required information security and dedication of resources in high-demand scenarios (e.g., situational awareness in crowd-control situations). Therefore, risk-carrying capacity may be slightly lower than for railways, but technological design still needs to consider wide-area coverage and/or quick local deployments.

Broadcasting

Broadcasters are facing a similar dilemma to that of blue light organizations. As terrestrial distribution methods are phased out (i.e., DVB and similar), what will replace them becomes a burning question. Although there is a specific 5G derivative for broadcasters, namely, 5G broadcasting, it is far from clear if this will be deployed. Many public broadcasters are also obliged to make their services accessible in sufficient quality, which adds to the quality obligations of their networks.

Beyond distribution technology choices, contribution and production technologies will need to be revisited. For example, we recently reviewed the costs at large live events and found that contribution and production costs could be significantly reduced by using 5G. Also, 5G would enable high-quality citizen content to be contributed.

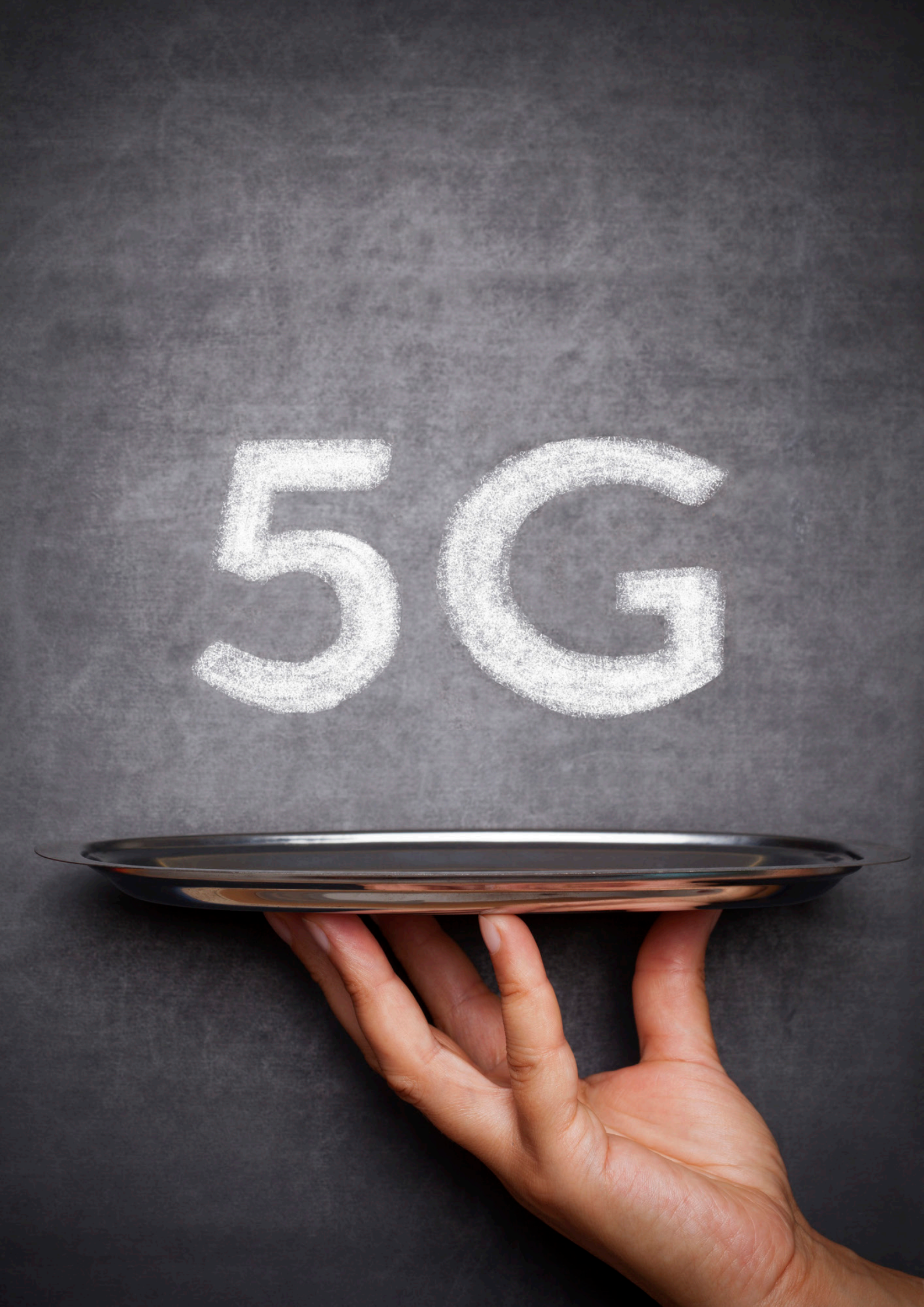
It is probably too early to say if 5G broadcasting will supersede regular IP-based video traffic in public networks when distributing linear TV. But even if video feeds are simply streamed to user devices, telecom operators will soon realize they are better off isolating network resources to meet broadcasting demands. Thus, we expect broadcasters to consider the utilization of slices too.

The value add of slicing in terms of TV distribution is increased manageability of the service. This is true even if broadcasters opt for 5G broadcasting over regular IP-based distribution.

Conclusions

Clearly, there are many more potential customers for network slices. Whenever there is the need to have a guaranteed service – driven by requirements such as risk carrying, required network quality, and ubiquitous, high-quality coverage – slices are a relevant option.

Yet there is an ongoing debate: how big does the customer base need to be to justify a slice, instead of some form of service guarantee? Some argue that we will see thousands of slices, e.g., whenever an amateur gamer connects their device to a competitive game, a slice will be created. However, we argue that, at least in the short term, only a few slices will be deployed, and devices will be dynamically and instantaneously associated with a slice when relevant but disassociated when no longer needed. This will maintain a greater level of resource efficiency and avoid isolating network resources, which can be expensive if the resources affected are scarce, such as spectrum.


5G

4. 5G Wholesale: For telcos willing to open up/ separate their networks, 5G offers new wholesale opportunities beyond traditional mobile

Substantial 5G capex requirements are causing telcos to think beyond existing B2C and B2B business models in order to appeal to new investors

As telcos look to finance the rollout of future 5G infrastructure, most are constrained by a capex-to-revenue ratio of around 15–20 percent. Challenger telcos are constrained not only by limited capex funding, but also by having to catch up with the incumbent infrastructure, which, in most cases, provides better coverage and higher capacity. Best-in-class 5G networks require not only sufficient spectrum and the latest active network, but also a high level of site fiberization. The investment horizons of the underlying infrastructure range from 20 years (fiber, spectrum) to five years (active equipment) – as such, telcos find it difficult to obtain funding mechanisms that match the life of the underlying assets.

Given the nature of 5G infrastructure – a high level of site fiberization, and a dense mobile network deploying high band and millimeter wavelength spectrum – a market cannot afford to have multiple overlapping 5G networks due to prohibitive costs, as well as aesthetic constraints.

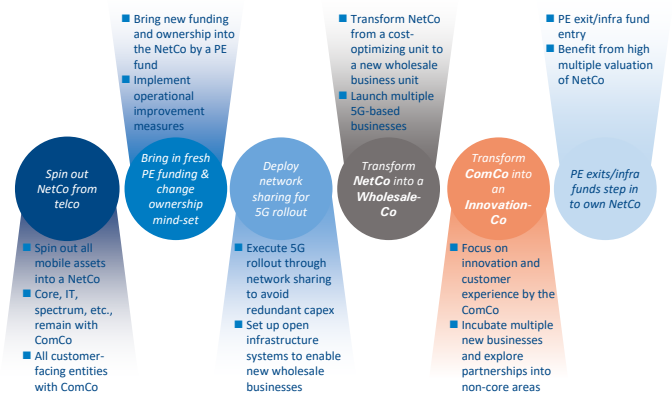
Can new wholesale business models make it more attractive for new non-telco entities to bring fresh investment into future 5G infrastructure?

Structural separation into a ComCo and NetCo can enable not only new investment from non-telco entities, but also new wholesale business models.

Carving out and spinning-off the telecom infrastructure into a separate NetCo could create a basis not just for fresh investment from PE/infrastructure funds, but also partnership-based investment from non-telco entities such as municipalities, utilities, and property developers. These entities can both contribute funding and facilitate the use of real estate infrastructure to roll out a common, dense 5G network.

Once a best-in-class 5G network is rolled out, it can be used as a basis to set up new wholesale businesses. Some wholesale businesses can be launched directly by the NetCo or the ComCo, while for other wholesale business, the NetCo can partner with other specialized entities to bring in specific domain knowledge, complementary infrastructure or additional funding.

Figure 26: Structural separation to facilitate new investment from non-telco entities



Source: Arthur D. Little analysis
ComCo – Commercial arm of telco after split, NetCo – Network arm of the telco after split

Would fresh non-telco investment enable the NetCo to roll out best-in-class 5G infrastructure?

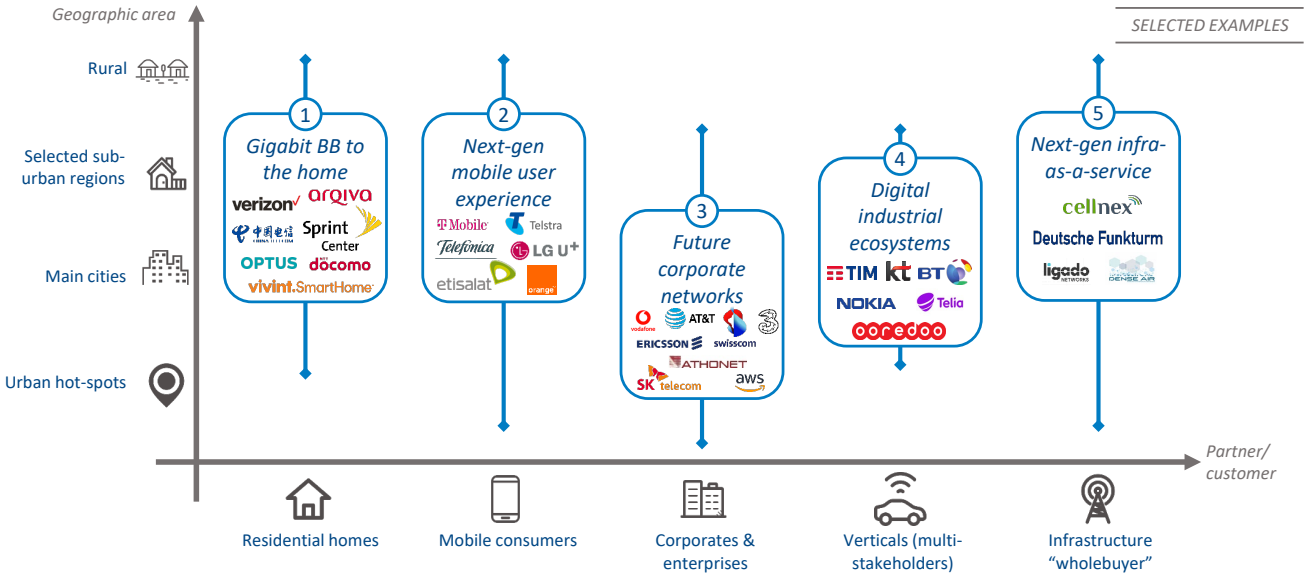
Sufficient 5G capex can help build a best-in-class 5G infrastructure boosting traditional mobile B2C and B2B business models

An independent NetCo can deploy a best-in-class 5G network with additional funding from new financial and strategic partners, which can then be used by its former retail arm, the ComCo, and also help set up new wholesale business units.

The ComCo can transform itself into an InnovationCo focusing on delivering high customer experience and launching new services built upon the high-quality 5G network, thereby winning back market share from the incumbent. Since the ComCo is now an asset-light entity, it can react to the market much faster than a traditional asset-heavy telco and establish itself as the market leader.

The details of executing and managing such a structural separation can be found in the Asset Monetization section of this report.

Figure 27: Five 5G deployment models



Source: Arthur D. Little analysis, communication of CEOs of respective operators, publicly available data

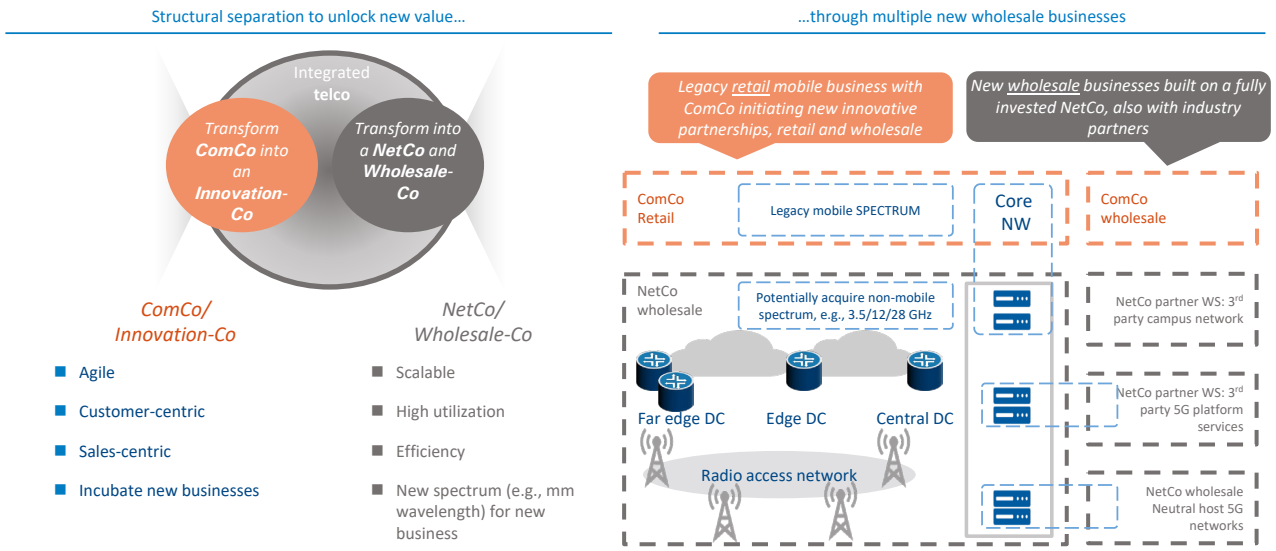
The same best-in-class infrastructure can be used to kick-start new wholesale business across all five 5G deployment models

An independent NetCo with best-in-class infrastructure can transform itself into an active revenue-seeking entity, instead of just being a cost center. The same mobile infrastructure that was traditionally used for just one business model, i.e., mobile user experience, can now be used to facilitate new revenue streams across all five 5G business models (see Figure 27 for details of the five 5G business models).

The NetCo can partner opportunistically with specialized strategic partners to launch new wholesale businesses (e.g., campus networks) or resell spare capacity in the network to other fixed and mobile telcos (e.g., 5G FWA and 5G mobile infrastructure services). Each new business can be set up and managed independently as a Special Purpose Vehicle (SPV), which may lease infrastructure access from the NetCo, lease spectrum from the ComCo, develop its own specialized capabilities, and set up its own service platforms/core network.

Eventually, the NetCo can be recapitalized as a holding entity for multiple wholesale business units (e.g., pension funds for long-term assets, strategic partners for specific wholesale business units) so that each business unit can be managed with an operating model suitable for that particular business.

Figure 28: Using the NetCo (and ComCo) as a base to kick-start new wholesale business models



Source: Arthur D. Little analysis

5G-based FWA

5G-based fixed wireless access (FWA) is expected to be the first 5G business commercialized. With 5G mobile still a few years away, some MNOs are already using the spare 5G capacity on their mobile networks to launch 5G FWA products.

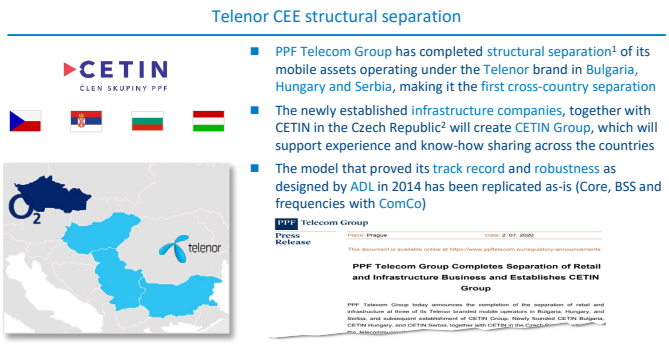
An independent NetCo can actively seek to monetize any spare capacity on its network by selling wholesale capacity to other telcos and regional internet service providers. Furthermore, an independent NetCo can also acquire high band or millimeter wavelength on its own to roll out an FWA network, using the same underlying 5G infrastructure for both FWA and mobile, thus creating infrastructure synergies within its existing assets.

5G mobile wholesale

Providing data and voice connectivity to the former telco/ ComCo will continue to be the main bulk of revenues for the NetCo. However, the NetCo can actively seek to provide other infrastructure-based services to other telcos as well. Depending on who owns the mobile spectrum, either the NetCo or the ComCo can sell wholesale connectivity to mobile virtual network operators (MVNOs) in the market.

For example, PPF Group OpCos in the Czech Republic, Hungary, Serbia and Bulgaria separated their NetCos into individual entities from the parent MNO. These separate entities together will be called Cetin Group. The separated NetCos provide connectivity services to the parent MNO, but also actively seek new wholesale revenue streams by providing wholesale infrastructure/transit/B2B services to other telcos.

Figure 29: Structural separation of PPF group OpCos in Central and Eastern Europe



Source: PPF, CETIN, Arthur D. Little analysis
1) Separation of commercial and infrastructure assets into two independent entities; 2) First voluntary structural separation carried out in 2015

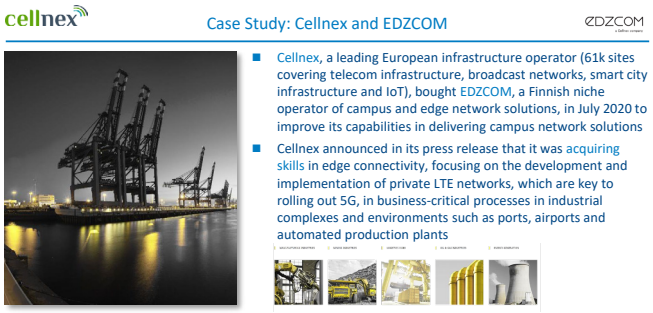
Campus networks

An independent NetCo can partner with industry specialists to provide not just connectivity, but also connectivity-based solutions to specific industries, leveraging the common infrastructure.

For example, Cellnex, one of the largest infrastructure operators in Europe, recently acquired EDZCOM, a Finnish specialist operator of LTE networks, to strengthen its campus network rollout and operational capabilities in specific industries such as manufacturing, mining, logistics, oil & gas and energy. Alternatively, the NetCo can also partner with system integrators to offer industry-specific campus network solutions, in which the NetCo deploys the infrastructure and the system integrator partner operates the infrastructure.

Further details on campus networks and mobile private networks can be found in the B2B chapter of this report.

Figure 30: Cellnex buying EDZCOM to acquire specialized competencies to operate campus

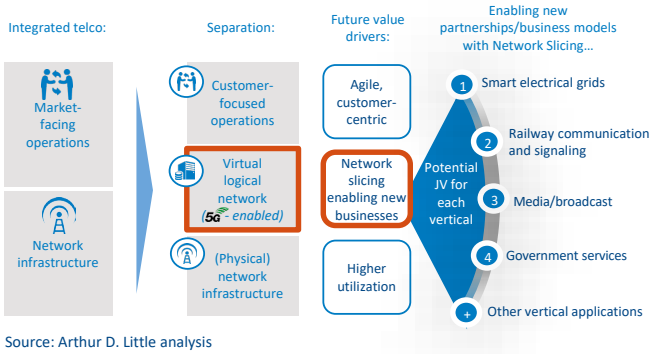


Source: Arthur D. Little analysis, Cellnex, https://www.edzcom.com/ https://www.cellnextelecom.com/content/uploads/2020/07/Cellnex-H1-2020-Press-Release.pdf

Smart platforms and ecosystems

5G provides new capabilities, such as network slicing, that enable the use of a common infrastructure to provide specialized and specific network use cases for individual customers.

Figure 31: Leveraging the 5G infrastructure to roll out smart platforms for multiple use cases



Source: Arthur D. Little analysis

For instance, a slice of a telecom network can be created and configured to provide specific connectivity services for a railway company, while another slice of the same network can be used to provide a smart platform for a city to offer education-based services across multiple schools and universities.

Consider the City of Vienna, which recently ran multiple tenders to set up a common infrastructure platform, as well as other bids for specialized operators to set up service platforms for education, mobility, healthcare, etc.

Figure 32: City of Vienna announcing the launch of a 5G smart platform for education

Stadt Wien

Smart City Vienna

- Arthur D. Little is assisting the City of Vienna in setting up a world-class 5G infrastructure with the right incentives to encourage efficient rollout of the network (e.g., reduce red tape for micro sites/small cell rollout) and create new commercial use cases (e.g., engaging with students and industry to showcase new use cases)
- Additionally, the city itself is investing €20m to roll out a neutral 5G platform that will enable new services in the areas of education, mobility, healthcare and public safety
- The first four pilot projects on the way to being implemented:
  (1) Telemedical wound care
  (2) Increased safety at traffic lights
  (3) Augmented reality for virtual learning at Viennese historical buildings
  (4) Autonomous drones helping the fire brigade

Source: Arthur D. Little analysis, https://www.wien.gv.at/presse/2020/05/06/stadt-wien-zuendet-den-5g-turbo-20-mio-euro-fuer-raschen-ausbau, https://www.adlittle.com/sites/default/files/viewpoints/adl_5g_for_cities-compresse_0.pdf

Neutral host networks

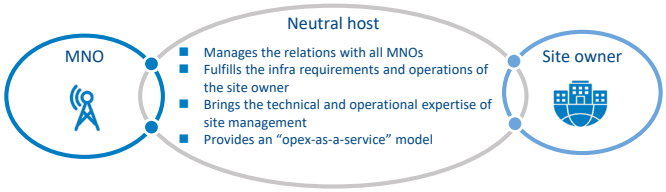
An independent NetCo can roll out and operate a common infrastructure for multiple telcos to plug in their own spectrums and/or active equipment. This is especially relevant in an urban setting, such as a shopping mall, stadium or business complex, where it is not operationally possible (due to lack of space) or desirable (reduces aesthetics, decreases property value) to have multiple overlapping infrastructures.

Property owners also often call for bids from infrastructure operators to roll out and operate common 5G networks on their premises. An independent NetCo stands a better chance of winning and building such a network, as it is perceived to be neutral, and can also offer better economic conditions to both the property owner and other operators.

Figure 33: Neutral host networks to provide infrastructure access and services

Definition of the "neutral host concept"

A neutral host is **third-party cellular network** providing **wholesale**, commercial, **mobile localized coverage** solutions to MNOs or other communications **service providers**



Source: Disruptive analyses, Commscope, Arthur D. Little analysis

For example, the City of Barcelona announced in 2020, through a public tender, that it would roll out a common 5G infrastructure in all properties owned by the City, and any interested telco or other service provider would be able to get access to this infrastructure in the future as needed.

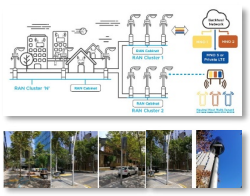
Figure 34: City of Barcelona rolling out neutral host network in its properties

Neutral-host small cell deployment in Barcelona City Council

5GCity

Context:

- The city council of Barcelona is deploying a 5G neutral-host platform comprising indoor and outdoor small cell deployment at its properties, which multiple tenants, including MNOs and any private LTE operators, can access to deliver telecom and other 5G small applications
- Each MNO gets access to RAN colocation space and access to the distributed antenna system using Moran, Mocn or GWCN
- The configuration allows for sharing of spectrum or deploying spectrum individually
- The technical details include O-RAN-aligned vRAN, cloud-native NFV/SDN vRAN, open orchestration and data APIs, and 4G today, integrating 5G SA, extensible RIC xApps, and mission-critical quality



Neutral-host small cell platforms offer telecom operators plug-and-play capability to cover an entire area without physical deployment of sites

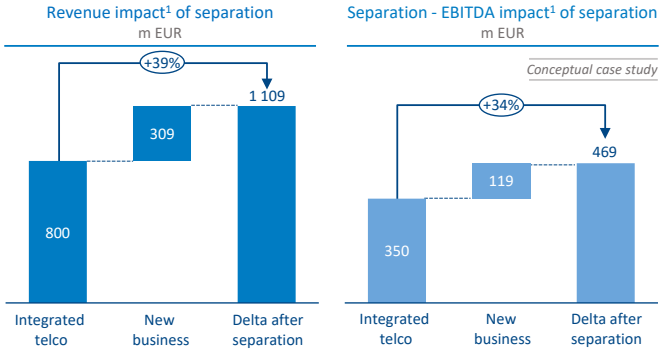
Source: Arthur D. Little analysis, , https://www.accelleran.com/drax-barcelona-city-council/

How much new revenue can be obtained through new wholesale businesses?

Expect 40 percent revenue and 60–70 percent enterprise value increases through launching of new wholesale businesses

Arthur D. Little conducted a simulation of the business potential if a traditional challenger telco in a market of 10mn subscribers were to spin off its network into an independent NetCo and set up new wholesale businesses across all five 5G deployment models. We estimate that the overall revenue potential (of both the ComCo and NetCo) could increase by up to 40 percent, and the EBITDA increase could be as high as 35 percent.

Figure 35: Potential revenue uplift of 40 percent by new wholesale businesses

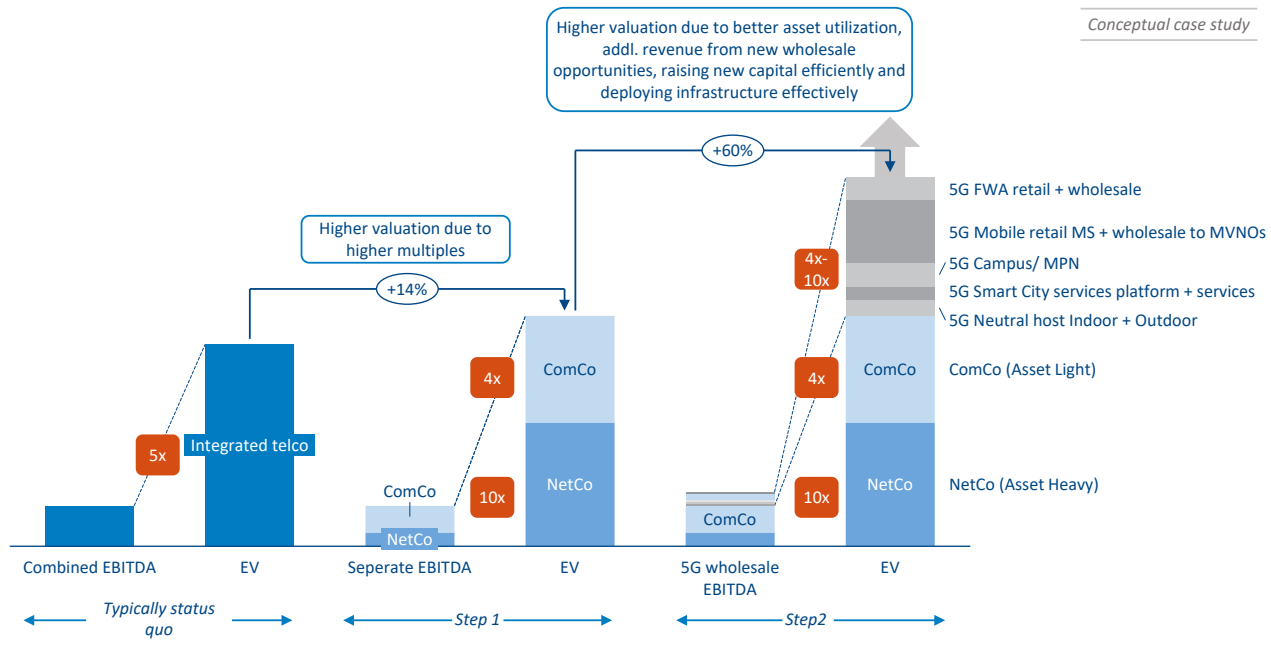


Source: Arthur D. Little analysis
1) Assuming an MNO with base revenue of €800m and 4m subs, in a country of 10m inhabitants

Most of the revenue (at least 90 percent) is due to new wholesale business across each of the five 5G deployment models. However, the ComCo can capture some additional retail revenue (approximately 10 percent) by leveraging a best-in-class 5G network to provide better mobile customer experience and expand opportunistically in FWA in parts of the country.

The overall enterprise value increase could be as high as 60–75 percent – part of it (up to 15 percent) due to financial engineering, as a NetCo can command higher multiples than an integrated telco, but the major part (up to 60 percent) due to unlocking new wholesale revenues from the new businesses across all five 5G business models.

Figure 36: Potential enterprise value uplift of 60-75 percent due to separation and new wholesale businesses



Source: Arthur D. Little analysis
Note: EV – economic value, i.e., the valuation of the company on the market
*) Telecom infrastructure players typically have multiples of 10–12; whereas cloud infrastructure/data center providers typically trade as high as 13–15 times EBITDA

Beyond Core strategy for telcos – How to succeed?

5. Grow beyond core: An imperative for telecom operators

Increasing pressure on core business

Year after year, Arthur D. Little's Value Growth Tracker confirms a structural trend: telecom operators are being marginalized within the digital ecosystem. Analysis of the top 180 digital companies' performances globally shows that telecom players' revenue almost flattened in 2019, whereas internet players and ICT companies still experienced double-digit growth (see Figure 37).

While market capitalizations of digital players have over-performed the main market index over the last 10 years, the market capitalization of telecom operators follows the average evolution of stock markets (see Figure 38 overleaf).

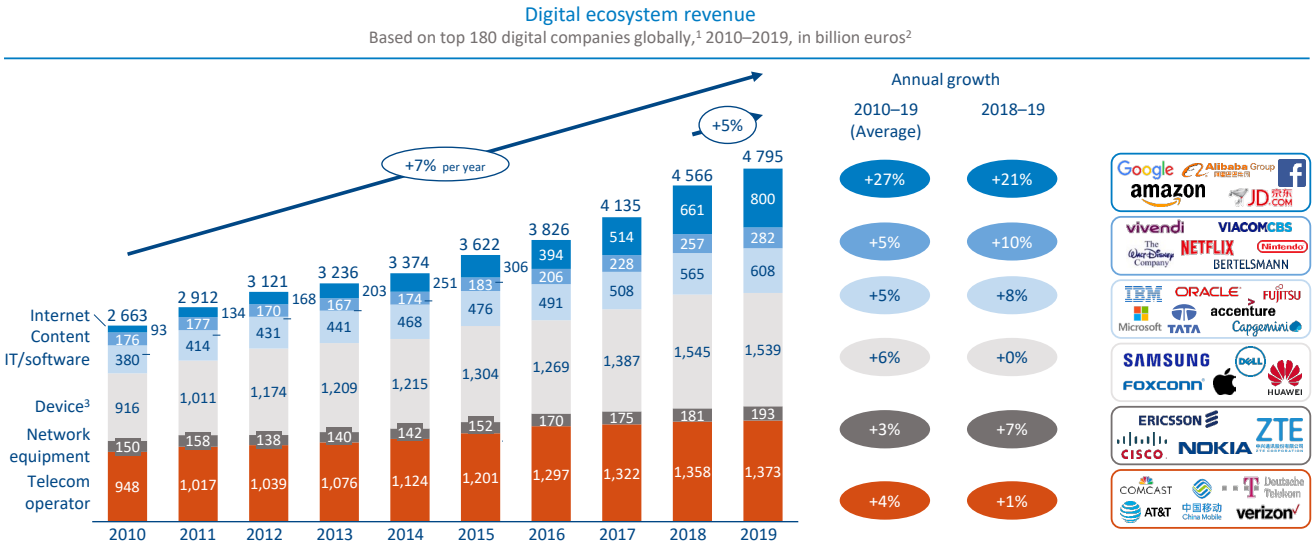
In 2020, the COVID-19 crisis accelerated this deep-rooted trend: globally, the crisis has boosted the digital ecosystem by accelerating adoption of new technologies. The crisis has exacerbated the value shift to leading internet and ICT champions, as illustrated by stock-price variation during the year: Microsoft, +40 percent; Google, +29 percent; and Oracle, +21 percent – compared to AT&T, -26 percent; and Verizon, -3 percent.

The reason is well known: telecom operators are mostly fragmented local players evolving in a highly competitive environment. In Q4 2019, 88 percent of the top 50 telecom wireless markets globally were formed by three or more players, and a majority of these markets experienced increased competition and market concentration according to their HH Indexes.[8] On the other hand digital champions – Amazon, Google, Alibaba, Foxconn, etc., – have a global play with a large economy of scale.

The telecom revenue/investment "scissor effect"

From fixed voice to mobile data, and now fiber access, telecom operators have to continuously invest in new technologies to cater for the surge in traffic demand. For the first time, telecom operators are facing a double investment challenge of 1) accelerating the transition to mobile data and 2) accelerating the rollout of their fixed broadband infrastructure.

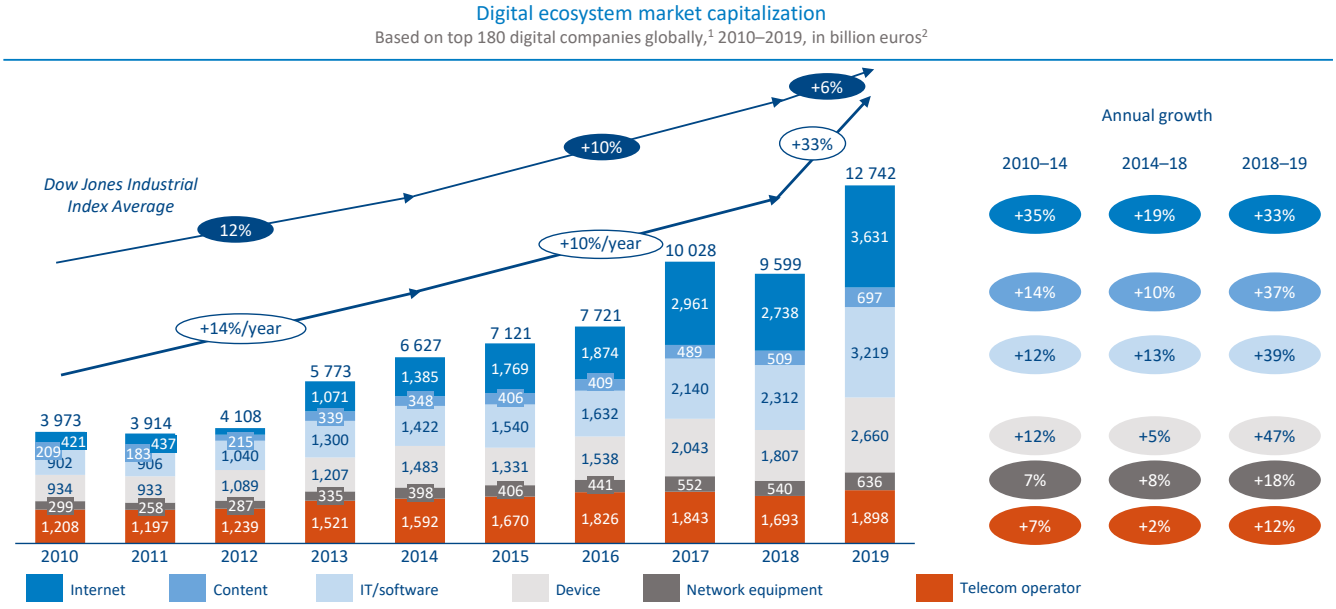
Figure 37: Revenue evolution of top global digital players



Source: Thomson Reuters Eikon, Arthur D. Little analysis
Note : 1) Panel of 180 companies: By sector, selection by turnover of the top 30 companies in 2019, 2) Constant 2019 euros, 3) As Huawei is not listed, the revenues have been added to the top 30 terminals, which in 2019 will represent 55% of Huawei's business

8 Based on BofA Merrill Lynch Global Research estimates; market concentration measured by the Herfindahl-Hirschman Index (evolution of the sum of the squares of subscriber market shares 4Q18 vs 4Q19)

Figure 38: Market capitalization of the digital ecosystem

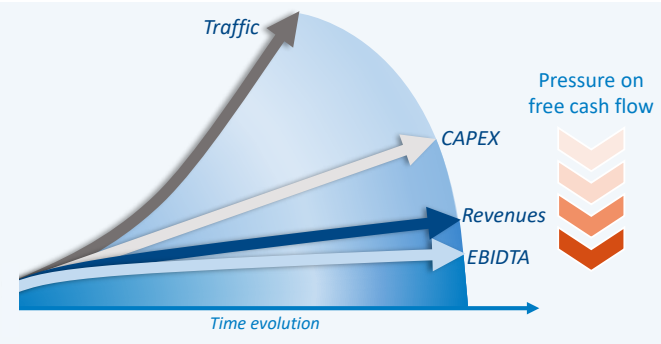


Source: Thomson Reuters, Arthur D. Little analysis
Note : 1) Panel of 180 companies: by sector, selection by revenues of companies of top 30 in 2019, 2) Euros constant 2019

Moreover, mobile and fixed telecom networks are converging because 5G needs fiber to deliver its full value proposition. Telcos are therefore facing increasing pressure to accelerate their investment plans while revenues are stagnating, if not decreasing.

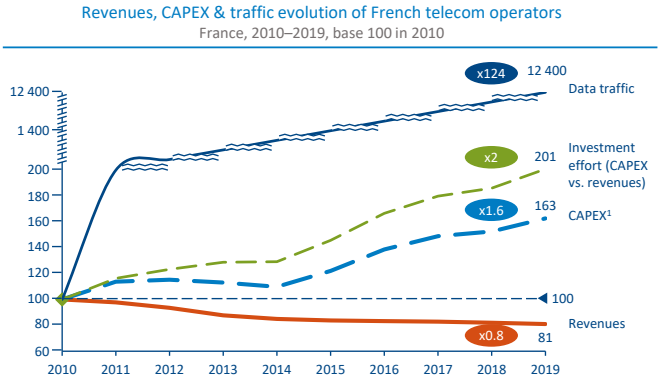
Consequently, the pressure on telcos' cash flows has never been so intense. For instance, Arthur D. Little's yearly report issued with the French Federation of Telecom Operators highlights that the capex of telecom operators has increased by 5–6 percent per year since 2010, while revenue has steadily declined by 2 percent per year over the same period (see Figures 39 and 40). A similar trend can be seen in most geographies.

Figure 39: The free cash-flow squeeze of telecom operators



Source: Arthur D. Little analysis

Figure 40: The free cash-flow challenge of French telcos



Source: ARCEP, DARES, Insee, Arthur D. Little analysis
Note : 1) Excluding frequency acquisition

A squeeze on cash flows exacerbated by the COVID-19 crisis

The COVID-19 crisis has boosted demand from both residential and enterprise customers for data-hungry applications. Video-based applications – such as streaming, gaming, and videoconferencing – are now accounting for more than 75 percent[9] of total data traffic of telcos globally in 2019, versus 55 percent in 2014. Telecom operators must accelerate cash-flow generation in order to upgrade their networks and meet the demand for data, which, for the first time, is exceeding supply.

The imperative for telcos to extract more value from their assets is urgent – all the more so given that the divide between digital players and telcos has widened during the COVID-19 crisis, in terms of both performance and valuation.

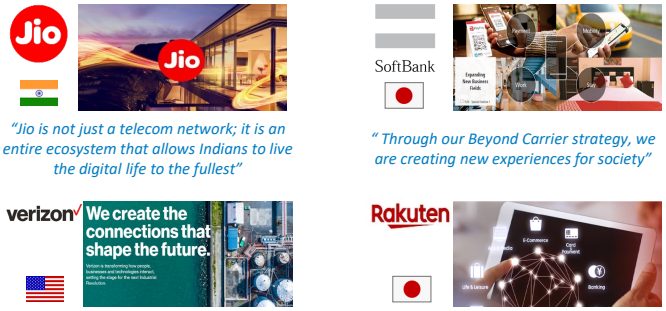
9 Based on Cisco Systems Virtual Network Index data

An "era of convergence" is opening new opportunities for telcos to expand beyond core

Most markets have entered the "era of convergence", characterized by rapid development of cross-sector activities accelerated by digitalization. Such convergence can be observed between banking and telco players and automotive and tech players. Since telecom operators provide the core infrastructure supporting the digital applications, they have many opportunities to position themselves with new businesses beyond their role as connectivity providers.

Most advanced telecom operators have anticipated the profound transformation of their business models. These players do not present themselves as telecom operators anymore, but as digital life enablers (see Figure 41).

Figure 41: New innovative models of future telcos



Source: Arthur D. Little analysis

- Reliance Jio, the leading Indian telecom operator, became "Jio Platforms" at the end 2019, completing its transformation from a telecom operator to a comprehensive digital services provider offering content services (JioTV, JioSaavn, JioCinema, etc.), payment solutions (JioPay, JioMoney, etc.) and e-commerce solutions (JioMart).
- SoftBank in Japan has invested in its Beyond Carrier strategy since early 2000 to establish one of the most diversified models in the industry via acquisitions and the development of innovative activities. The group built on the foundation of its telecom network to invest in innovative global digital players transforming daily life and industry, such as DiDi (mobility-as-a-service), WeWork (collaborative working spaces), OYO (for hotels) and PayPal (for payments), with a corporate philosophy centered around the motto "Information revolution, happiness for everyone",[10] in order to embrace the fourth industrial – digital – revolution.
- Verizon's vision is to "transform how people, business and things connect with each other", setting the stage for the next industrial revolution. Verizon developed a technology-centric diversification strategy by investing in leading innovative models and creating synergies with its high-quality data network across four areas: 5G verticals (connected cars, smart energy, e-health, etc.), media & technology (digital services such as Yahoo and digital technology-based solutions), cybersecurity, and the Internet of Things (fleet management with Verizon Connect, smart communities or smart solutions for utilities).
- Rakuten in Japan illustrates the paramount role that telecom networks have to play in the development of future digital ecosystems. Originally a diversified digital solutions and services provider, Rakuten invested more than USD5bn in building its own telecom network, and in February 2020 launched a 5G native network based on fully cloud-based infrastructure. This move to 5G aims to accelerate its development in innovative solutions such as express delivery by drones and autonomous vehicles, cloud gaming, and virtual reality services from entertainment to professional training.

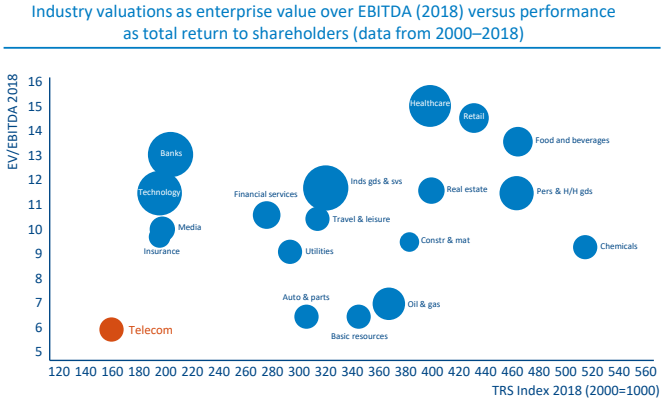
These innovative players are all positioning themselves as ecosystem facilitators leveraging their core connectivity business to develop innovative services in adjacent territories.

Growing beyond core to build the new model of the telecom operator of the future

Telecom operators have tried for decades to develop new opportunities beyond their core businesses, with mixed results so far. Today, in an era of accelerated digitalization, expanding beyond core has become an imperative for two major reasons:

1. Telcos need to improve their equity value - by finding new sources of cash flow to sustain the investment in their core businesses and increase the value of core assets. Diversifying into new businesses offers higher returns, as the telecom sector has experienced one of the lowest equity values over EBITDA and lowest total shareholder return over the last 10 years (see Figure 42).

Figure 42: Industry valuations versus performance

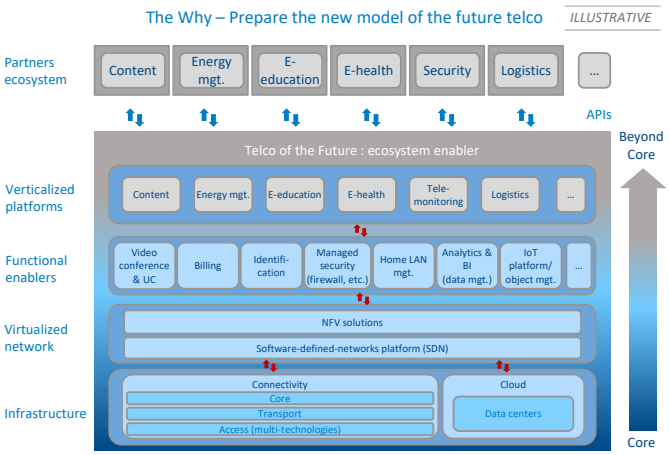


Source: Thomson Reuters, Datastream, Arthur D. Little analysis
*Total return to shareholders

10 See Ken Miyauchi, Softbank Corp's CeO vision https://www.softbank.jp/en/corp/aboutus/message/

2. Telcos need to build the foundations for the renewal of their business models - with digitalization, telecom operators are becoming multi-vertical ecosystem enablers that provide functional solutions, such as payments, managed security, IOT platforms, data analytics, etc., and verticalized platforms, such as e-education, e-health, and smart energy (see Figure 43). This deep-rooted transformation trend has been emphasized by the surge of demand for digital services in the context of the COVID-19 crisis. More than ever, telecom operators have unique opportunities to expand their services beyond core.

Figure 43: New innovative models of future telcos



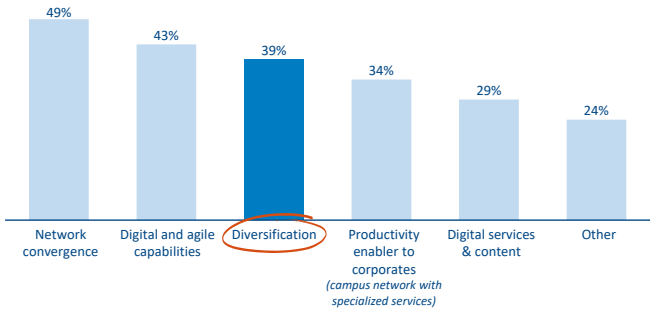
Source: Arthur D. Little analysis

What respondents say

Growing beyond core naturally emerges as one of the top strategic priorities quoted by 100+ C-level respondents interviewed by Arthur D. Little's TIME teams. This is a global trend: diversification ranks as one of the top three strategic priorities in any market surveyed (see Figure 44).

Figure 44: Diversification, a strategic priority for the C level

Arthur D. Little survey
Question: What do you believe are value drivers for the future?



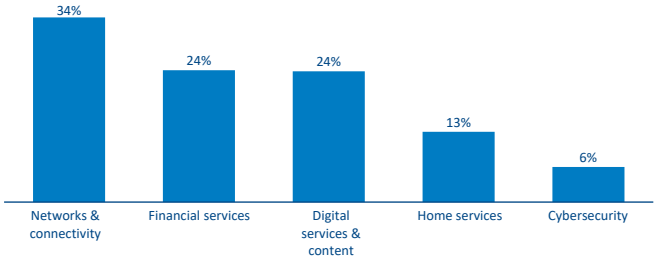
Based on 100+ interviews of telecom ExCos conducted in 2020

Source: Arthur D. Little analysis

For respondents, the main areas for diversification are naturally related to telcos' core business: solutions leveraging core assets are quoted by more than one-third of respondents. These include cloud-based solutions, data analytics, managed networks, security and IoT platforms. Respondents also identified financial services (payments, insurance, fintech solutions) and content and digital solutions (video-based digital solutions, e-commerce) as main areas to explore for driving future value (see Figure 45).

Figure 45: Main areas for telecom operator diversification

Zoom on diversification answers
Question: Which areas of diversification are "must haves"? Which have been a distraction so far?



Based on 100+ interviews of telecom ExCos conducted in 2020

Source: Arthur D. Little analysis

While there is a consensus on the imperative for telcos to explore new growth areas beyond core business, no "must have" solution can be drawn from the interviews:

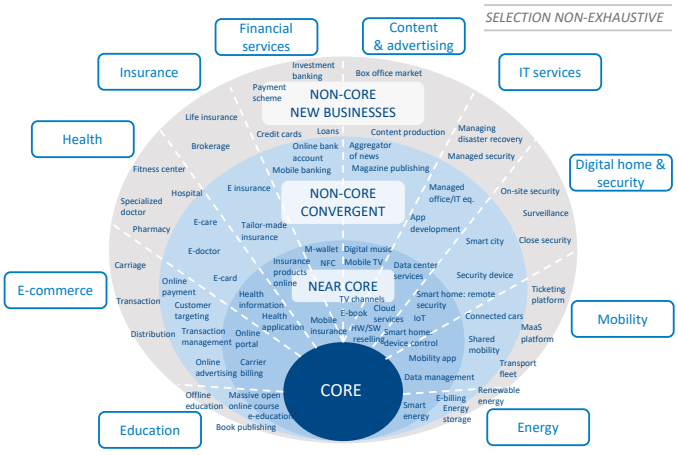
- Respondents highlighted the central role of telecom operators as enablers of the digitalization of other industries, quoting cloud services, the IoT and data analytics as near core areas to focus on. Fintech services were brought up by many respondents as a successful diversification area for telcos, as technology plays a central role in building disruptive services.
- Although there is no "must have" solution, 'how' to achieve diversification becomes the central question to be addressed. A majority of respondents mentioned the high rate of failures in telcos' attempts to expand into new businesses. They agree that it's legitimate for telecom players to develop new solutions beyond connectivity and have unique assets to leverage, primarily their brands. However, respondents also recognized that telecom players were still on a learning curve regarding the diversification of their solutions.

6. The "What?" is not the question, as long as telcos ensure a consistent diversification strategy within their core businesses

An almost infinite area of diversification for telcos

The new era of digitalization and convergence opens up a wide variety of diversification opportunities for telcos (see Figure 46).

Figure 46: An almost infinite array of diversification opportunities for telcos



Source: Arthur D. Little analysis

Telcos' core business itself can also be renewed: technological disruptions such as software-based networks, network function virtualization, edge computing and 5G will define a new core of their own – forming a basis to explore beyond core opportunities.

Our extensive benchmark of 100+ diversification initiatives from telecom operators globally shows that a growing number of players are making bold moves into adjacent businesses far beyond their core businesses. Telecom operators are exploring a wide array of new areas not directly related to their connectivity solutions (see Figure 47):

- SK Telecom has developed a leading MaaS solution in Korea through its proprietary application T Map, which has quickly become popular thanks to safety functionalities such as "Emergency button" and "Ride tracking" – the solution has also been continuously enriched through SK know-how in analytics.[11]
- T-Mobile launched "Park and Joy" in 2017, a parking solution that facilitates parking-slot identification for drivers in Germany and enables remote booking and payment of parking tickets.[12]
- Orange in France has transformed its VIP brand "Parnasse", launched in 2008, into a home butler solution provider, targeting very high-value customers (lawyers, doctors, white-collar SoHo, etc.) through premium telecom services, such as a highly secured encrypted messaging service and a dedicated digital coach, in addition to traditional butler services.[13]
- O2 in the UK launched a competitive car insurance product, O2 Drive, enriched with an application that enables drivers to measure their driving scores for safer driving.[14]
- In Spain, Orange partnered with Zurich Insurance to create unique telco insurance products. In Sweden, Telia developed in just a few weeks an innovative remote patient-monitoring solution in the context of the COVID-19 crisis. (Please see later for detailed presentations on these two innovative initiatives.)

Figure 47: Some non-core diversification initiatives developed by telcos

Mobility platform	Parking management	High-quality concierge service	Car insurance	Telco insurance	E-health
"T Map", a MaaS application that secures rides and offers innovative mobility services based on data analytics	"Park and Joy", a parking application that allows German drivers to find parking slots and facilitates payments	"Parnasse", a concierge service for premium customers, with unique services to facilitate their digital life	"O2 Drive", a competitively priced car insurance offering with mobile app to improve driving safety	"Orange Seguros", a unique telco/insurer partnership to develop innovative & digitalized insurance products leveraging analytics	"Telia Division X" and Tactio developed a remote monitoring solution for chronic disease patients and COVID-19 risk groups

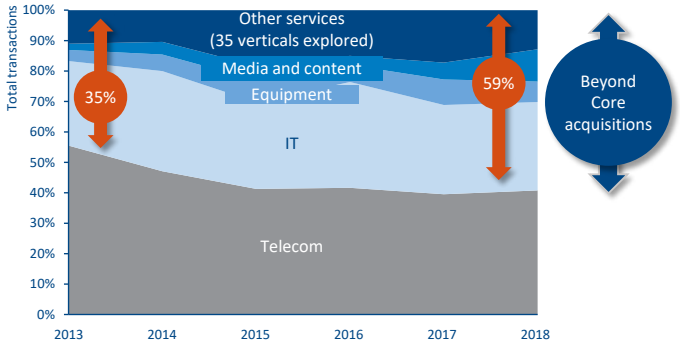
Source: Telecom operators' websites, Arthur D. Little analysis

11 https://www.sktelecom.com/en/view/introduce/mobility.do
12 https://www.parkandjoy.de/urban-mobility
13 https://www.parnasse.fr/en/; Parnasse clients can subscribe to the secured messaging solution, Cryptopass, developed by Orange Cyberdefense
14 https://www.o2.co.uk/shop/services/drive

Most of the benchmarks for sizeable Beyond Core initiatives come from telco players that are already pursuing diversification: these initiatives have supported their top lines, and without them, their financial situations would have been even more pressing. More importantly, digital services are the ones offering the highest-value growth as opposed to traditional telco connectivity services.

Our analysis of recent M&A transactions conducted by telecom players reveals that although IT-related services remain the primary area for diversification, operators are exploring a large variety of new domains. Besides traditional "near core" investments in the equipment or content & media domains, we note an increasing number of M&A transactions relating to financial services and pure "non-core" areas such as e-commerce, power services, health, education, and building & construction services (see Figure 48).

Figure 48: M&A diversification for telecom operators – analysis of 1,350 M&A transactions performed by telcos 2013 – 2018



Source: : Merger Markets analysis, Arthur D. Little analysis
Note: 1) Diversification of telecom operators, including all types of acquisitions and participation

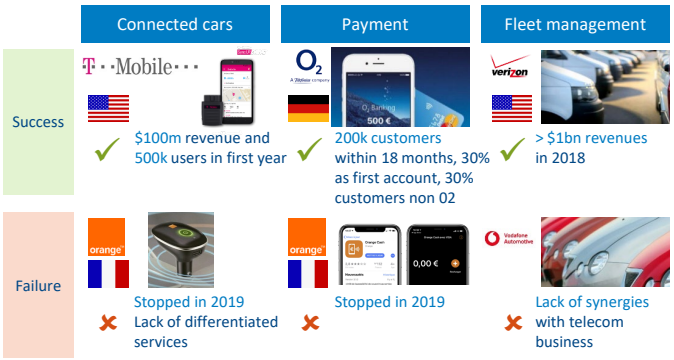
The "What?" is not the question: Only the "How?" matters

Large telecom groups have tried to replicate innovations – including Beyond Core initiatives – that have been successful in one market in their different OpCos, with mixed results so far.

The difficulty for large telecom groups to export their Beyond Core initiatives between markets underlines the importance of the implementation phase to succeed in diversification. For example, a large European telecom group successfully launched a connected car solution in the US, managing to generate $100mn+ in revenue within one year. Leveraging the success of this connected car solution, the group deployed "me-too" concepts with the same technological partner in three European markets, but failed to replicate its initial success.

There are multiple examples of successes and failures relating to similar diversification initiatives (see Figure 49).

Figure 49: Failures and successes of similar diversification concepts



Source: Telecom operators' websites, public information, ADL expert interviews, Arthur D. Little analysis

Arthur D. Little's benchmark of telecom diversification initiatives shows that ***less than 15 percent of initiatives are generating sizable revenues 24 months after launch***. Most of the time, the revenue contribution of Beyond Core initiatives remains highly marginal, and multiple "internal restoring forces" dampen initial enthusiasm and ambitions.

Three common pitfalls explaining the failure of diversification initiatives at telcos

#1: Lack of compatibility between the business model and core business

- Cost structure: Telecom operators often struggle to deploy concepts within cost structures that are not aligned with their mass-market models. Typically, operators fail in developing people-centric models – such as IT support services – because their core models are based on distribution of highly standardized connectivity products.
- Go-to-market: Many telecom players try to replicate a "one size fits all" approach for their diversification concepts. They tend to force non-natural "cross-sell" into their pull channels (in-store, telesales, inbound), which leads to both added costs and poor take-up of the new product. For instance, telecom operators often fail when trying to sell energy packages or home security services in stores, as customers do not perceive this as a natural fit.
- Agility: Telecom players are usually not process-compatible with new business areas populated by innovative competitors (e.g., fintechs).
- Brand: Although it is often a key asset for telcos to establish partnerships with innovative players, this might become an

issue when the telco tries to leverage its brand to enter into perceived "unnatural" business areas such as health.

- Global vs. Local: Telecom operators tend to duplicate successful concepts in new geographies without proper assessment of local market-demand specificities.

#2 Allocation of resources not aligned with ambition

- Investment in new concepts is usually over-inflated in the early stages of development, particularly during the incubation phase and the first years following launch, which creates unrealistic expectations of the new concept's contribution to the business.
- Cost knock-on: Organic development of new diversification concepts involves resources beyond the dedicated diversification teams, i.e., shared functions (HR, finance, etc.), distribution and sales, client service, etc. The involvement of internal resources indirectly increases the pressure on core business activities (reduced budget) and creates tension and pressure to deprioritize the diversification initiative.
- Core/non-core arbitrage: We note a tendency for telcos to deprioritize non-core activities in times of crisis for the core business, which is increasingly often given the fierce competition in many telecom markets. Management tends to postpone non-core activities, which results in missing the opportunity window to launch a new innovative concept.

#3: Big challenges in transitioning the diversification initiative into a scalable business

- Scale-up: Telcos often struggle to scale incubated innovative models into stand-alone businesses independent from their core activities.
- Risk-averse resources: Telcos willing to divert internal resources to non-core activities struggle to identify employees ready to assume the personal risks of developing new businesses.

However, some telecom operators are learning from their multiple failures and gaining maturity in understanding of how to diversify their activities. In many geographies, Arthur D. Little's TIME teams support innovative players in building successful Beyond Core business models and ensuring successful implementation. Following are two emblematic studies of innovative Beyond Core initiatives that were successfully launched recently by major telcos with the support of Arthur D. Little's TIME teams.

Diversification use case #1: E-health solution developed by Telia, Sweden

Remote monitoring for chronic-disease patients and COVID-19 risk groups

Partnering with scale-ups to deliver critical digital solutions

Although Telia has extensive experience of delivering critical solutions to the healthcare sector, the agile and focused ways of working in scale-ups enabled the company to deliver innovative solutions answering urgent needs.

Using state-of-the-art innovation to solve pressing public healthcare issues

The public health system is facing increasing demands from patients with chronic diseases, which, in developed countries, can exceed 80 percent of public healthcare spend. To meet this increasing demand, new innovative ways of providing care are needed that meet very high patient-safety requirements, data security and budget restrictions.

Remote monitoring of patients has proven to be very effective, from both the patients' perspective (increased availability) and a budget perspective. With the advent of COVID-19, the demand for remote monitoring has increased immensely, as it has become difficult to monitor risk groups with in-person resources.

Partnering with scale-ups to deliver healthcare innovation

To meet this challenge, Telia recognized the need to expand its focus and knowledge within digital health and increase its in-house competence to deliver new products and solutions. However, it became evident that its internal development was being overtaken by more focused, venture capital-backed firms. In response, the company created Telia Division X, which benefited from a separate structure to the rest of Telia, and swiftly pivoted to a partner-oriented approach – capitalizing on Telia's robust technical and market knowledge while leveraging the agile ways of working of smaller firms.

Although scale-ups have proven to be robust partners, start-ups (i.e., firms in even earlier stages of maturity) are less suited for partnerships at this level. The scale-ups that Telia Division X ultimately selected as its partners had to be fairly established in their niches – and not active within Telia's commercial footprint. By ensuring this, Telia had full freedom to take these partners with them to market, without creating competition on its home turf.

In collaboration with the Canadian scale-up Tactio Health, Telia Sweden was able to develop and bring an all-in-one remote-monitoring solution to Swedish primary care within a matter of weeks. The solution allows for remote check-ins, assessments of patient health condition, and better intelligence on patient history. It is made possible by collecting health data from the patient at home with help of different health-related sensors connected to the patient's smartphone application. The information is automatically sent to a caregiver portal where it can be combined with patient data from other sources. Patient and caregiver can communicate via chat to optimize medication and treatment. By using this solution, patients can become more engaged through an active role in their own treatment. Ideally, they can also learn more about their health to adapt their behaviour and positively influence their own health situation over time. As an additional side effect, this can create less burden for healthcare providers by reducing the number of hospitalizations and thereby also the costs.

Telia has an excellent track record of delivering critical services to Swedish authorities and professional organizations, which enabled it to expeditiously establish trust in the solution in the public healthcare system.

Diversification use case #2: Telcoassurance - an appealing opportunity

Telecommunication companies all around the globe are looking for new growth and differentiation opportunities. Financial services, due to high consumer relevance, huge market size and remarkable value pools, are always key potential opportunities to explore. Arthur D. Little engaged with Orange to build a new insurance service offering, in which the telco is in charge of insurance products distribution and setting customer experience guidelines, and an insurance partner is responsible for insurance products and services manufacturing and handling the customer care and servicing.

Insurance was an appealing market to explore: usually two to three times bigger than telco, anti-cyclical (as proven during the last financial crisis) and profitable (margins of ~5–10 percent of total sales). Banks have already identified this opportunity, partnering with insurers to create a new diversification initiative: bancassurance. These joint business models are currently enjoying the fastest growth and profitability rates within the insurance industry (both for insurers and banks).

Orange Spain sought to learn from the bancassurance business model and enrich it with two competitive telco advantages: their huge and unique customer knowledge and their close digital relationship with them. Learnings from bancassurance included **aiming big** (banks such as CaixaBank consistently get more than 25 percent of their total results from their bancassurance units), creating a **convenient and competitive value offering** for customers (e.g., cheaper mortgages bundled with home and life insurance), and building **long-term relationships with insurers**, incentivizing them to invest in the new business and reach an appropriate return on those investments. (Building a new insurance product can take up to 9–12 months and cost more than $500k).

Telcos can take insurance distribution to the next level by leveraging their customer knowledge to hone the timing of the insurance offer (e.g., making an SME insurance offer when a customer buys a B2B telco product), select the most profitable customers (using telco data to predict customer profitability), personalize prices without reducing profitability (more than 20 percent expected price reduction in certain insurance products) and simplify the purchasing experience (from more than 35 questions to buy a car insurance to just one thanks to existing customer data). This depth of customer knowledge, together with its remarkable digital reach (typically more than 20 percent of customers use telco digital channels monthly) and the massive number of potential customers (all B2C and SME telco customers), set the foundations for a very interesting diversification effort.

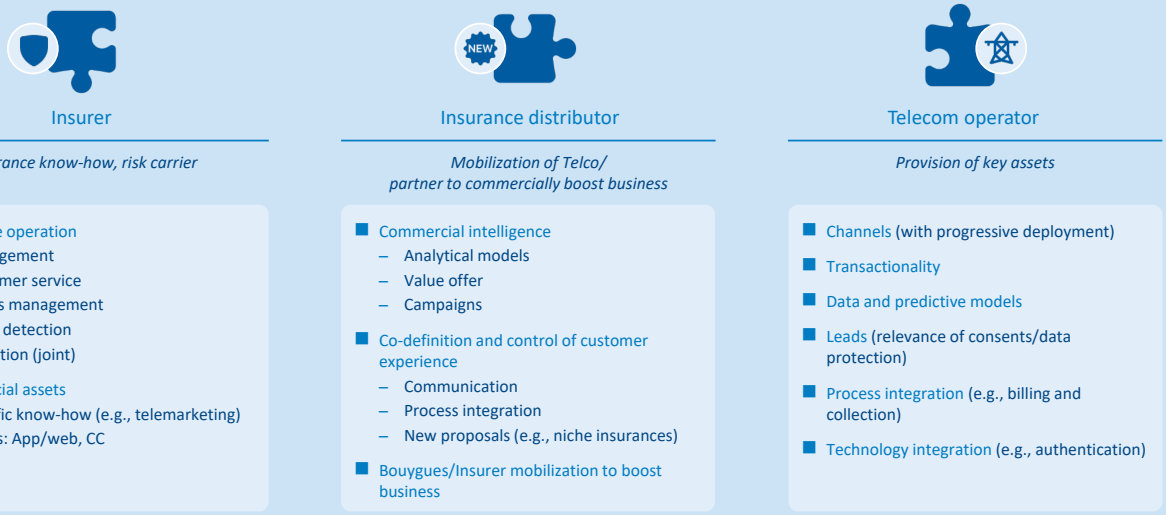
We built the partnership in four stages: defining the target business model, selecting the right partner, negotiating the relationship, and launching the business.

Defining the target business model started with the analysis of Orange's internal capacities and how it could contribute to a successful telcoassurance business model (what we called the *vision paper*): how to leverage telco distribution channels, which products had the strongest cross-selling potential, how to apply customer knowledge/data, and how to leverage existing customer care platforms and customer touchpoints (such as collections and renewals). The initial telcoassurance approach was based on proven bancassurance best practices and models.

We then focused on defining the ambition of the new business model, which, without much difficulty, was able to make a relevant impact on Orange Spain's EBITDA levels in the mid-term. With this outcome, we determined the most appropriate role for the telco, considering three main alternatives: (1) Orange as a lead distributor (easy to set up, but with limited P&L impact); (2) Orange as a reseller (still limited P&L impact); and (3) Orange and the insurer as partners in building an integrated insurance distribution model (which would enable more comprehensive differentiation and allow the telco to capture more economic value).

We made three recommendations at this stage: (1) leverage learnings from banks and retailers that were already distributing insurance at massive scale; (2) capture key advice from experts within the insurance sector during the analysis; (3) involve the relevant areas of the telco in the evaluation and decision-making of the target business model (e.g., strategy, marketing, finance, etc.).

Figure 50: Telcoassurance model



Source: Arthur D. Little analysis

Selecting the *right* partner requires a CEO-level relationship. Orange Spain engaged with CEOs from selected insurance companies to share the telcoassurance vision paper and discuss its feasibility and how the insurer would accelerate its development. All insurers were eager to present their preliminary perspectives to add value to the vision paper, according to their experience and own capabilities and assets, before developing and presenting detailed, non-binding offers of the capabilities and economic models they proposed.

We make three recommendations at this stage: (1) show transparency of the actual capabilities and resources that the telco company would make available to the business; (2) clearly present the business vision and requirements; (3) carry out a structured process, which would ensure that insurers would make comparable offers.

Negotiating the relationship benefits from having two or three shortlisted insurers to speed up conversations. Firstly, focus on achieving a fairly detailed agreement about what the business will look like, as well as the expected contribution of the insurer and the telco (a ***framework agreement*** detailing corporate structure, economic structure; rights, responsibilities and obligations of each party; branding; etc.), and establishing the detailed roles and responsibilities of the team that will launch the business to expedite business set-up. In Orange Spain's case, a specific commercial distribution agreement was created to limit liability and meet regulatory requirements.

We make three recommendations at this stage: (1) engage with the top management of both companies regarding critical decision-making tasks; (2) define in detail key aspects of the collaboration (e.g., economic agreement, targeted resources, trade agreement policy); and (3) fully detail business agreements before engaging the legal teams.

Launching the new business is always a complex process and usually takes longer than expected. It is critical to set up the team from both parties (telco and insurer) early on and agree to focus on building the first products to be launched (identify customer target needs, leverage the capabilities of each company, assess speed versus quality on launch, select the minimum viable product – MVP – etc.). The operating model set-up and development of IT capabilities can be adapted for each of the products (MVP approach). Finally, both companies must work with regulators (insurance and telecommunications) to build the required legal structure.

We make three recommendations for this stage: (1) apply a pragmatic approach to launching the business, balancing impact and ease of release (MVP) – choose a product that helps generate the relevant customer base and returns in the short term, and is quickly available and easy to integrate into business dynamics, and choose the proper distribution channel (readily available, requiring minimal integration); (2) define sprints with clear and high-value deliverables; and (3) establish a shared telcoassurance team culture – the key to developing a telcoassurance opportunity is the creation of an open and reliable partnership from an early stage, based on interest alignment and a shared vision.

7. The "How?" to succeed – A shift of paradigm is required

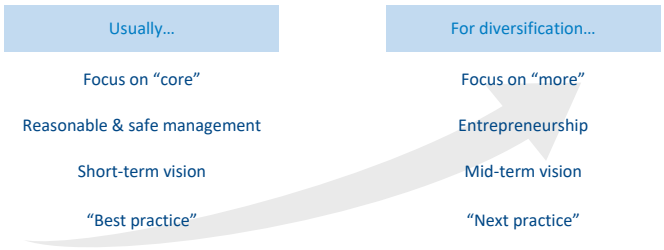
Telecom players have pursued diversification strategies for decades to create long-term value and achieve sustained growth. Routes to diversification are rarely linear: before becoming one of the leading global telecommunication infrastructure providers, Nokia was originally a pulp mill selling toilet paper rolls in the 1960s.

Traditionally, companies such as General Electric have diversified via inorganic acquisitions, as well as investing heavily in R&D programs. Telecom operators have followed the same route with a relatively high rate of failures. Our analyses show that there is no magic recipe for telcos to succeed in diversification, but rather, a set of pitfalls to avoid and levers to be actioned.

A prerequisite: Adopt a new mind-set

We firmly believe that to succeed in implementing a successful Beyond Core strategy, telcos should first adopt a new mind-set and have a "test and fail" approach to adopting new models (see Figure 51).

Figure 51: A change of mind-set is required for telcos to succeed



Source: Arthur D. Little analysis

Telcos usually confront four internal diversification hurdles that they must overcome to succeed:

1. Focus on core: Diversification initiatives are often nipped in the bud because of business-as-usual imperatives. Internal teams will keep on raising objections during the development of the diversification concept. This natural "resistance to change" often leads to drastically scaling down the initial ambition, if not terminating its development prior to launch.
2. Reasonable and safe management: The ambition of new initiatives is often curbed by predominantly risk-averse management. Our experience shows that management will systematically favor concepts that are close to the telco's core business model, blocking most innovative concepts in their initial stages.
3. Short-term vision: Many telcos are focused on identifying the "Holy Grail" concept that will generate a large cash flow in a short period. The analysis of the most successful diversification reveals that a multi-year maturation phase is required before new concepts can start to have a sizable impact on the business. It took four years for Amazon Web Services to fix its business model, and almost a decade for Dassault to mature its CAD solution and create Dassault Systems, its dedicated business unit that is now one of the fastest-growing companies on France's major stock market.
4. Best practice: Another common hurdle to furthering a diversification opportunity is the lack of tangible success in other markets, even failures. But in a fast-moving environment, in particular in this period of the COVID-19 crisis, the focus should be on identifying the "next practice" rather on duplicating proven models. For instance, benchmarks show that telcos have traditionally failed to enter the smart home space – however, this does not mean that this domain should not be explored (see below).

Smart home – From failure to success for telcos?

Large telcos have had ambitions to develop smart home solutions for many years. However, initial attempts to enter this space in the 2010s led to multiple sizable failures.[1]

In January 2018, Telefonica shut down its O2 Smart Home service in the UK after poor take-up,[2] following the decision of its rival, BT, to terminate its Home Monitor service. In the US, Verizon stopped offering its Home Monitoring and Control solution at the end of 2014, two years after

1 https://www.analysysmason.com/research/content/comments/smart-home-operators-rdme0-rdmb0/
2 https://advanced-television.com/2018/01/10/o2-abandons-smart-home-service/

its launch, while AT&T stopped its Digital Life offering. In Europe, Proximus took a similar decision about its Home Control and Home View solutions, while Orange announced in April 2019 the end of its Homelive smart home solution.[3]

However, since 2019, we have noted a resurgence of initiatives from telcos to re-enter the smart home space. This move is concomitant with the launch of smart home solutions built around virtual assistants offered by global internet players (Google, Amazon).

The digital ecosystem around smart home is rapidly evolving and telcos have realized they can't just give up the opportunity to OTT players. They've learnt from their initial attempts and now understand the need to partner with solution providers. Telefonica has joined forces with Huawei to develop innovative cloud-based smart home solutions in Latin America,[4] and is recentering its Smart Home approach through its Aura AI-based platform, which integrates Google and Microsoft solutions.[5] Orange reinvested in the smart security space in France by partnering with an established player and launching Protectline in January 2019.[6]

3 https://communaute.orange.fr/t5/homelive/Arr%C3%AAt-du-service-Homelive/td-p/1804883
4 https://www.huawei.com/en/news/2016/2/Smart-Home-category-in-Latin-America
5 https://cloud.telefonica.com/en/information-centre/news/telef%C3%B3nica-and-microsoft-establish-strategic-partnership-to-design-the-telco-of-the-future/
6 https://www.groupama.com/fr/journalist/orange-groupama-creent-protectline-societe-commune-dediee-a-telesurveillance-biens-france/

Concept selection: Think in "start-up" mode

Throughout the concept selection phase, the Beyond Core team should ensure that the concept meets three requirements:

1. The diversification concept answers a client need with tangible benefits.
2. The concept is aligned with the telco's core strategy and will be supported by some senior executives.
3. The concept leverages some of the telco's unique differentiators, i.e., the concept is not immediately replicable by competitors.

From ideation ("What can be done?") to selecting the initiatives to be launched ("What should be done?"), a "start-up" mindset is required:

- **Be client-centric** by continuously trying out the concept on targeted clients through "real life" stress tests across the telco's customer-facing channels (in-store, call centers, digital, mobile app, etc.), and through workshops with the sales team and vendors.
- **Be inspirational** through a robust "five-minute elevator pitch" to be tested first with the ExCom, but also with internal teams and potential partners; the pitch should be continuously solidified through different discussions and play a central role in selling the concept to both internal and external parties, including investors.
- **Be agile** by leveraging existing platforms and digital interfaces to test the concept:
  - The telco should ensure that the new concept's attractiveness and legitimacy is tested in the market through existing client touchpoints; for instance, call centers could go through a short questionnaire at the end of inbound calls and profile respondents.
  - We also recommend using social media to pretest the concepts; this can be done through "fake advertising" and measuring impressions, applause rate ("likes"), engagement rates (comments and shares), etc., over a few weeks. For instance, a large European car manufacturer successfully tested an innovative MaaS concept by marketing the service on social media and its website, and letting customers complete the online subscription process – the real status was disclaimed at the end of the process and a reward was offered in compensation.

Concept solidification: Multiply discussions with potential partners and other telcos

Once the business potential and telco's legitimacy are confirmed, the concept must be translated into an actionable implementation plan. Diversifying activities means that teams will enter unknown territories. Multiple internal restoring forces will quickly arise from operational teams, which will lead to high risk of postponing or deprioritizing the development of the concept. As arguments are made that the concept is impacting core activities, we highly recommend that Beyond Core teams quickly engage expert know-how and primary potential partners to strengthen the concept and build a model optimizing the utilization of internal resources.

During the consolidation phase of the concept, the diversification team should run workshops and discussions with innovative players and disruptive solution providers. These players have matured their business models and are able to provide a comprehensive perspective on the underlying drivers of a new business. These informal discussions are highly beneficial, allowing rapid focus on critical points and optimal launch paths. (For example, in financial services, obtaining legal authorizations and building a compliant IT platform are crucial aspects that need to be addressed.)

Early-stage engagement with potential partners creates the opportunity to test the concept through demos of the partner's solution. For instance, while working on the assessment of a connected car opportunity, Arthur D. Little's team convinced ExCom members to install an innovative solution in their company cars: this real-world test strengthened their decision to invest in the development of a proof of concept.

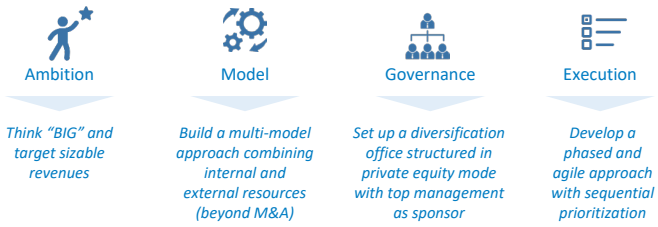
Telcos can also benefit greatly by learning from peers who have invested in similar concepts in other markets. These "peer-to-peer" discussions allow for the most common pitfalls to be anticipated during the implementation phase. They provide unique information to calibrate the business objectives and resources required, and an opportunity to pre-screen potential partners to engage with further. These discussions can also become "moments of truth" for the management to fully grasp the business potential of the concept, which is why we highly recommend that management directly participates to these discussions.

For a client assessing business opportunities around payment solutions, Arthur D. Little's team organized multiple experience-sharing interactions with a telco that had successfully developed an innovative payment solution. The discussions not only provided understanding of the underlying mechanisms around client enrollment and retention, but also revealed potential synergies with core products.

Concept implementation: Four priorities for telcos to succeed

Based on Arthur D. Little's unique experience in assisting telcos in defining their diversification strategies, we have identified four areas to focus on in order to successfully implement the Beyond Core strategy (see Figure 52).

Figure 52: Four priorities for telcos to implement successful diversification strategies



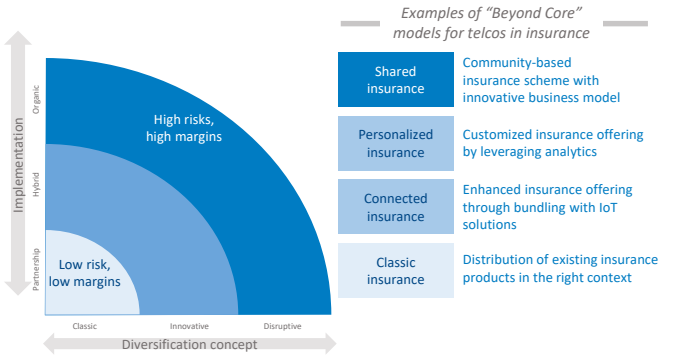
Source: Arthur D. Little analysis

Priority #1: Set the ambition

The value created from new near-core and non-core initiatives is directly linked to the level of risk and implementation complexity of the concept. Many telcos are often too cautious in their diversification approaches, which results in initiatives with limited financial impact. Telcos can benefit greatly from defining upfront the level of risk and ambition of their Beyond Core strategies. As mass-market players with established brands, telcos have a wide array of strategic options to assess: from simple generation of leads (e.g., test the client appetite for a third-party product) to more sophisticated development of a dedicated ecosystem platform supporting disruptive value propositions.

Example in insurance: a large array of business models, from generation of leads to development of innovative, data-based insurance models (see Figure 53).

Figure 53: Value creation from diversification is directly related to the risk level and implementation complexity of the selected concept



Source: Arthur D. Little analysis

Many telcos have already begun offering insurance coverage for smartphones and tablets sold in their stores. Although this classic Beyond Core product can generate sizable revenue, this initial move into the insurance domain should not be an end in itself: telcos have to "think big" upfront and define their target models in order to start generating sizable revenue. In the case of insurance, multiple growth models exist:

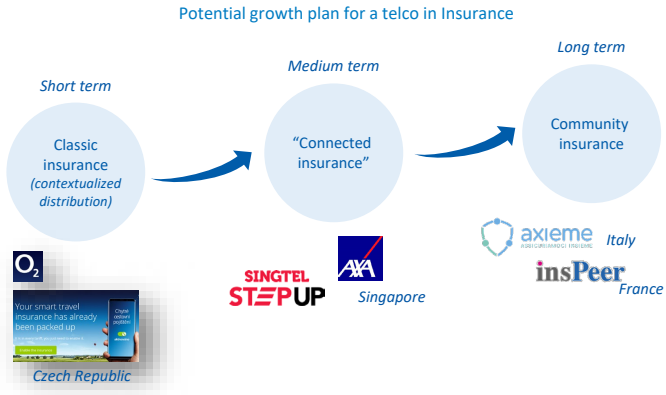
- Contextualized distribution of insurance products: Extend the mobile device coverage model by anticipating other client needs e.g., offer home damage coverage when the client is enquiring about home products or indicating a home move, push travel insurance prior to trips, or offer invoice payment coverage for customers who regularly check their invoices.
- Connected insurance: Partner with an insurance company to develop new products based on connected devices; for instance, Singtel and Axa jointly developed a smart car solution based on a smart car device, a cloud-based app and a platform analyzing driving patterns, which delivered customized car insurance coverage.[15] Singtel extended this model to health insurance by establishing a strategic partnership with AIA, based on the My Singtel app collecting data on customers' health habits and the AIA Vitality wellness program.[16]

15 https://www.singtel.com/about-Us/news-releases/singtel-and-axa-insurance-jointly-launch-smart-car-solution-for-a-beter-and-s
16 https://www.singtel.com/about-Us/news-releases/singtel-and-aia-ink-strategic-partnership-to-drive-welnes-for-consumers-in-si

- Connected insurance: Create a strategic partnership with an insurance company to combine the telco's analytical capabilities with partner expertise in building innovative and personalized insurance products. (See the case study "Orange Seguros/Zurich" for more details.)
- Shared insurance: The telco can also make bolder moves into the insurance business by anticipating future models, such as the development of community-based insurance products. An example is the type of disruptive peer-to-peer insurance model being developed by innovative "insuretech" companies such as Axieme in Italy.[17]

These models are not isolated from each other: a comprehensive growth plan should be designed upfront in order to define the level of ambition and resources to be allocated (see Figure 54).

Figure 54: A dynamic growth plan should be defined upfront per diversification domain



Source: Arthur D. Little analysis

Priority #2: Build a multi-model approach to develop the concepts

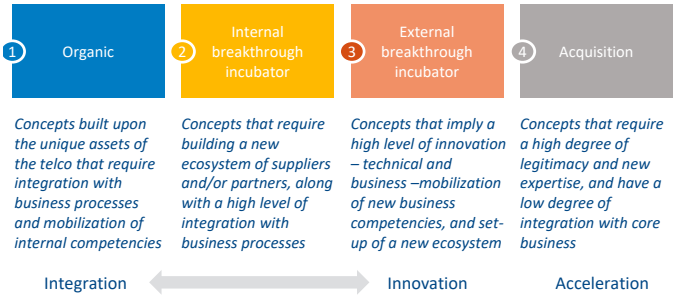
Most disruptive concepts are the ones less likely to be selected by telcos. These concepts often require the design of new business models, structurally different from the mass market model of a traditional telco. A good illustration is the connected car opportunity. Such initiatives are typically well received internally, as they complement the operator's core business of offering connectivity (at home, on mobility, in the car), and marketing teams will often be keen to develop such solutions organically. However, a concept built on a very different business model – such as home security services – will not be met with similar enthusiasm and risks encountering significant internal resistance. In this case, a new model to further develop the concept should be explored.

Our experience shows that it is highly beneficial for a telco to pursue several concepts in parallel through radically different models. It creates "positive competition" and team synergies between the selected initiatives. Most importantly, it maximizes success rates by adopting development models aligned with both the extent of the concept's innovation and its proximity to the core business.

We recommend four parallel models to help develop Beyond Core initiatives:

1. Organic development
2. Internal breakthrough incubator
3. Externalized breakthrough incubator
4. Acquisitions

Figure 55: Four development models for beyond core initiatives



Source: Arthur D. Little analysis

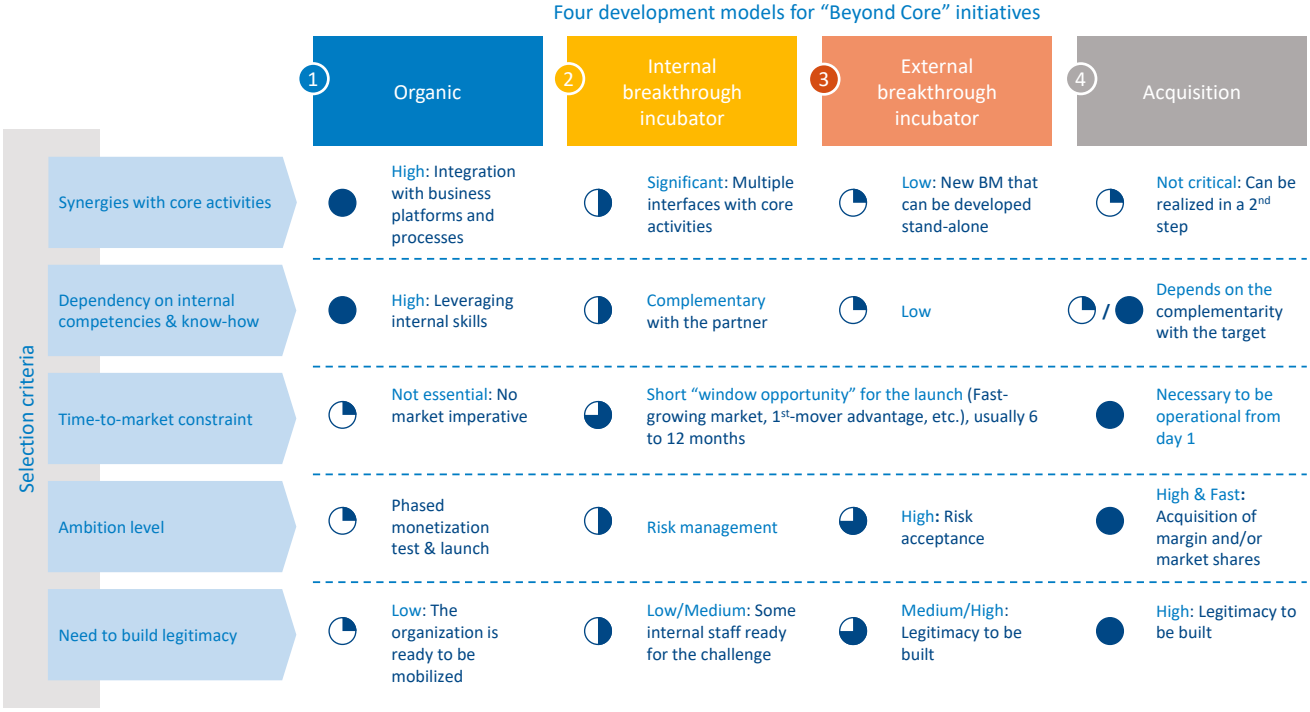
Organic development

Our experience shows that diversification concepts built upon some of the operator's key assets – such as brand, distribution channels, and network – should be integrated into the product development roadmap and managed by a dedicated product manager. Such initiatives should be driven by commercial teams even if they begin as new concepts, as they require a high level of integration with existing business processes. Moreover, any impact on core activities can be better anticipated, as the development of such concepts can create sizable costs. Typically, near-core concepts will fall into this category.

They include concepts such as connected car solutions, contextualized insurance coverage and aggregation platforms delivering value-added services. These concepts often require the involvement of internal expertise (technical, marketing, legal, etc.) and are built upon existing IT systems. The time to market should not be constrained by external business imperatives, and a phased launch approach – including proof of concept and beta versions – can be adopted.

17 https://www.axieme.com/eng-vers

Figure 56: Criteria to select the optimum model for beyond core initiatives



Source: Arthur D. Little analysis

Internal breakthrough incubator

Concepts that require a new ecosystem of suppliers and/or partners to be built, plus a high level of integration with external business processes, should be handled internally by a dedicated team. Such initiatives need to first be incubated before being scaled up into the commercial process. As such, we recommend the set-up of an internal breakthrough incubator:

- The dedicated team should mix internal resources with extensive knowledge of internal processes and external competencies with strong know-how of the new business domain.
- The team should be located under the direct sponsorship of an ExCom member.
- Business objectives should be defined upfront, with an initial budget allocated to the development phase.
- The team should have autonomy in the design of a minimum viable product and the selection of providers and partners, while being supported by the technical and operational functions of the telco (IT, network, procurement, HR, legal, etc.).

Typically, an internal breakthrough incubator is applicable to concepts requiring the set-up of a new platform and the development of partnerships with well-established players, but also strong integration with existing business processes. We recommend this model for concepts such as mobile payment solutions, cloud gaming, and energy offerings.

External breakthrough incubator

This model should be considered for the development of concepts requiring high levels of innovation, both technical and business. These concepts often require the involvement of external capabilities and the set-up of a new ecosystem of partners and suppliers, including joint-ventures or long-term partnerships with established players.

The external breakthrough incubator model should be built upon structural guidelines:

- It should be an independent structure, particularly in terms of procurement, resources and culture.
- The profile of the leader is key: they should preferably come from outside the telco organization, have solid expertise in the targeted new business, and have a "growth-stage start-up" mind-set; their compensation scheme should be results-oriented (no equity, but high bonus).
- The new entity should get the necessary support from the telco's main structure.
- Funding should be defined upfront along with the time-to-market plan.
- The new entity should have autonomy to select the partners to engage with.
- The team should be a mix of internal/external resources – ideally a joint team plus the core partner.

We recommend the set-up of an external breakthrough incubator for concepts requiring high levels of innovation, but with limited opportunity windows for the launch (12 to 24 months). This model is well adapted to the development of advanced insurance products based on data analytics or for the development of innovative home security products that integrate AI-based solutions (e.g., for image recognition) and leverage the IoT know-how of the telco.

Arthur D. Little worked with a leading European telco to support the set-up and launch of a greenfield cloud-based operator with an open-access business model targeting SMEs/SOHOs.

Acquisitions

Traditionally, telcos have favored acquisitions as a direct way to enter new business areas. However, they have often failed to successfully integrate new entities. We recommend the acquisition of innovative players when the telco's legitimacy needs to be established in a new area, but there is only a short window of opportunity to enter into this business and there are no direct synergies with core activities.

Telcos should follow three golden rules to successfully integrate innovative digital players:[18]

1. **Secure financing:**
   - Visibility: Secure the funds needed by the digital player for a minimum period of at least two years (in "PE fund" logic).
   - Get a reciprocal commitment from the digital player's management to develop its services as defined by the telco during this period.
2. **Maintain autonomy:**
   - Independence: The digital player must be autonomous in developing its original business model independently from the telco.
   - Governance: Guarantee freedom of action to the digital player's management while monitoring its activity as an investment partner.
   - Compensation: Create a compensation scheme that stimulates innovation and execution, adapted to the business model of the digital player (bonuses, profit-sharing, equities, etc.).
3. **Support the development of commercial opportunities:**
   - Focus: Target a clearly defined customer segment and support the digital player in developing its commercial capabilities, e.g., encourage the telco's sales teams to generate leads for the digital player (without reciprocity).
   - Top management: Involvement of one ExCom sponsor on the board of the digital player to (1) validate the strategy, (2) monitor its execution and (3) facilitate cross-fertilization with the telco's activities.

Accept the risk of failure

There must be an agreement upfront that allows for failure. Although the new business team needs to be accountable, it should not be judged on its first attempts. It is important to accept that out of 12 bets, only two might successfully generate the desired impact – but they will cover the losses of the other 10. Assume that the two "successful bets" will be #6 and #8 on the list.

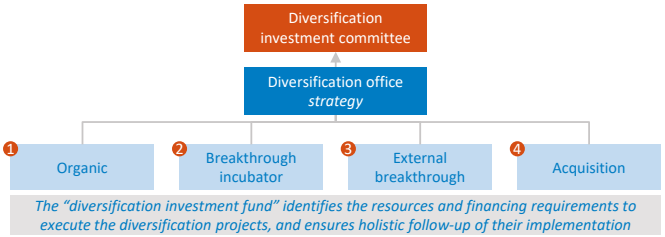
Priority #3: Set up a governance scheme inspired by private equity models

Governance is crucial for the successful execution of a diversification strategy. Governance should aim to: 1) prioritize concepts and trigger the execution mode, 2) set the pace and ensure rapid development of the MVP, 3) ensure that the models to develop the new concept fit with the ambition, and 4) allocate the funding.

A well-constructed decision-making mechanism (management committees, multi-layer decision platforms, a "fail fast" approach, etc.) is essential for buy-in from the entire organization and for creating a level playing field for resources (capex, IT, network, HR, MarComs, etc.).

We recommend setting up a diversification office chaired by top management that will pilot the development of concepts using a portfolio management approach (similar to private equity operating models). The diversification office should be chaired by an ExCom member – typically the chief strategy officer – and follow up with each diversification team on a regular basis, allocating resources and budget and dealing with operational trade-off issues. A diversification investment committee of ExCom members should review the development phases of all initiatives and assess operational trade-offs in terms of funding for the next development phase. The diversification investment committee might also decide to terminate some initiatives.

Figure 57: A governance structured around the set-up of a diversification office



Source: Arthur D. Little analysis

18 Extracted from Arthur D. Little report "The Age of Collaboration II" co-produced with MatchMakerVentures https://www.adlittle.com/en/age-collaboration-ii

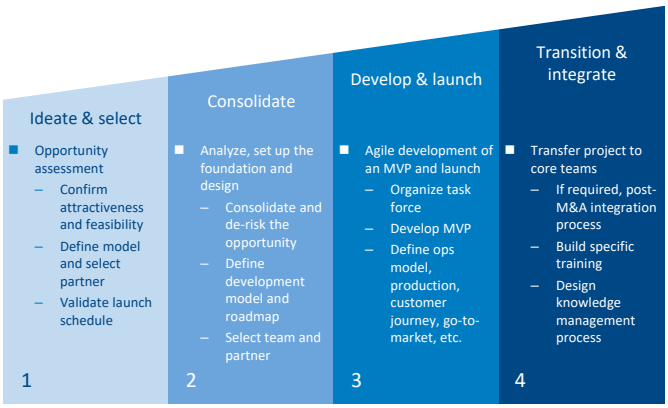
Priority #4: Develop a phased and agile approach to execution with key prioritization milestones

To succeed, a phased approach with clear milestones is required. We strongly recommend that each initiative goes through a validation process with predefined "go" and "no-go" milestones.

Within a telco organization, new business must support the core business. Therefore, early alignment and incentive arrangements at the management level are vital for scale-up and institutionalization to succeed. In particular, once the diversification initiatives have been selected, a consolidation phase should begin ("Phase 2"). The outputs of this second phase should be structured around three pillars:

1. Consolidate and de-risk the concept through a solidified business model, real-world test of the concept via targeted clients, identification of priority features, development of a sales pitch and communication guidelines.
2. Set up the development model through the pre-screening of partners, identifying and recruiting a project leader, building an organizational chart, and initiating a recruitment plan.
3. Design the targeted model with an operational structure defined for the delivery phase, an industrial ramp-up roadmap, a go-to-market strategy and an implementation roadmap.

Figure 58: A phased approach for execution



Source: Arthur D. Little analysis

A common pitfall experienced by many telcos is to believe that their current capabilities are a sufficiently strong foundation for venturing into adjacencies, whether it is customer data, customer reach and sales presence, or internal IT (e.g., operator billing, customer intelligence). Current capabilities should be scrutinized and subject to careful due diligence in terms of the new business opportunity. In many cases, the required capabilities can be provided by smaller start-ups or agile specialized partners rather than force-fitted into the telco's rigid operational model.

During execution, the new business team should, wherever possible, conduct independent trials and adopt satellite solution design, without internal input. This approach will ensure the early success or failure of the concept, and ultimately drive adoption within the overall organization.

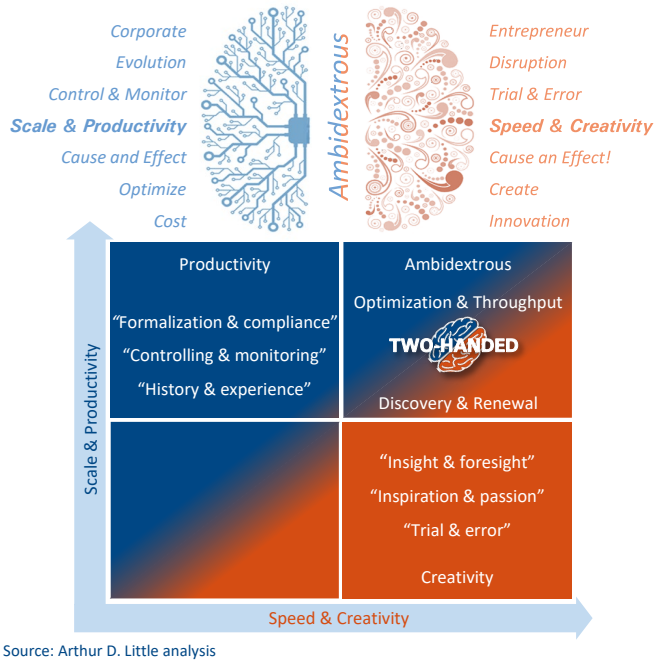
Conclusion: Become ambidextrous!

Telcos need to reflect deeply on how to transform their business models in the coming years, as they will continue to experience increasing pressure on their core business financials. In an era of digitization, diversification is a natural path for telcos, and success is within reach of those organizations that follow the right processes and avoid traditional pitfalls. We recommend that telcos adopt an investment portfolio approach to managing their diversification strategies. Such an approach has multiple advantages: it will create accountability within the organization regarding the diversification strategy, while maintaining an innovation mind-set within the diversification team.

Moreover, telco diversification will only be successful if it is part of a broader transformation strategy aimed at creating a more agile organization that nevertheless stays true to its core business principles. Telcos must become ambidextrous organizations to thrive, focusing on both core business activities and diversification strategies to unlock new revenue sources (see Figure 59).

Becoming ambidextrous will enable telcos to benefit from an optimized legacy structure while integrating creative initiatives to diversify activities beyond their core businesses.

Figure 59: Moving towards ambidextrous organization for telcos



Source: Arthur D. Little analysis


Asset monetization

8. More than ever, now is the time to reconfigure telco assets

Telco asset reconfiguration has been accelerating over the past few years, unlocking shareholder value

Since the early days of the Chorus/Spark (New Zealand, 2011) and CETIN/O2 (Czech Republic 2015) reconfigurations, several telco operators have embarked on a journey to unlock value through asset reconfiguration. The most visible reconfiguration trend has been the carve-out of passive infrastructure, such as towers by mobile network operators and the emergence of open-access fiber models. Today, more comprehensive reconfiguration models are being examined, with further testing of the boundaries between value creation and operational feasibility. The asset reconfiguration question is currently on the agenda of most management teams and boards of directors; close to 90 percent of respondents in our yearly interview with top executives stated that alternative options to unlock value from network assets were being considered.

Although no metric can easily isolate its impact, asset reconfiguration has unlocked value for shareholders and its benefits are multifold. For example, the Chorus/Spark reconfiguration secured new funding of $1.5–2Bn for FTTH deployment (of which one-third was government subsidized), increased consolidated EBITDA by 10 percentage points over seven years, and increased consolidated enterprise value by 200 percent over 10 years (compared to most European- and US-based peers, which ranged from -50 to +80 percent). The CETIN/O2 reconfiguration created a burning platform to turn around O2, resulting in stabilization of consolidated revenues (versus a 4 percent annual loss over the preceding three years) and 4 percentage points of consolidated EBITDA gains over four years, while enabling a 40 percent higher capex spend compared to 2014. PPF, the majority owner of both O2 and CETIN, completed the reconfiguration of its mobile assets under the Telenor brand in Bulgaria, Hungary and Serbia, achieving the first cross-country separation. The newly established infrastructure companies, together with CETIN in the Czech Republic, has created the CETIN Group, which will support experience and know-how sharing across the countries.

TowerCos as the spearhead for asset reconfiguration

The development of the telco asset market has been very successful, especially in the mobile towers domain. The largest TowerCo players began offering their services to MNOs back in the 1990s with spectacular results. For example, the combined market capitalization of the three largest American TowerCos (American Tower Company, Crown Castle and SBA) is approximately $213Bn, having increased at a 22 percent CAGR in the last five years.

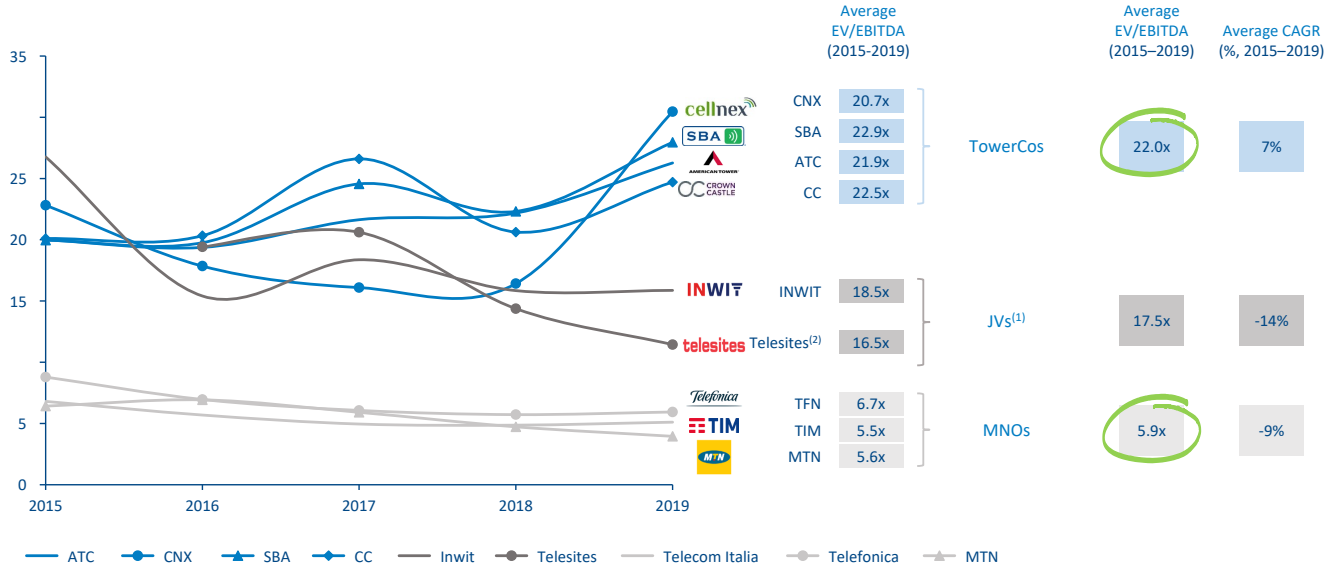
The growth of the TowerCo business model shows how asset reconfiguration can unlock substantial value in a very short period of time. From 2015 to 2020, European MNOs have been selling or carving out the majority of their towers, bringing the share of MNO-owned towers from 80 percent down to 20 percent in 2020. Cellnex, the largest independent TowerCo player in Europe, has grown at a 53 percent CAGR from 2015, achieving an impressive market cap of approximately €25Bn. Just five years since the start of its journey, Cellnex has consolidated 24 percent of the towers in the countries where it is present, which represent around 10 percent of all the towers in Europe.

The tower value creation model

The emergence of the TowerCo business model relies on a new win-win situation. On one side of this model, MNOs benefit from cash proceeds from the asset sale, while eliminating tower management through MLAs, which enables them to focus more on their core businesses and center their efforts on clients and products. On the other side, TowerCos acquire a very profitable asset with potential upsides and many optimization opportunities.

Additionally, the dynamic development of TowerCo infrastructure assets has resulted in very high valuations of TowerCos (over 22.0x EBITDA) compared to MNOs (c.6.0x EBITDA), as depicted in Figure 60. This has triggered a reassessment by MNOs and their shareholders of the value of these assets, which has encouraged them to set up captive TowerCos (i.e., for which the original MNO is the majority shareholder) that aim to capture

Figure 60: TowerCos vs MNOs EV/EBITDA evolution analysis (2015-2019)



Source: Arthur D. Little analysis, Refinitive Eikon
(1): Joint ventures between operators that have carved out their assets and created a captive TowerCo. (2): Opsimex and Telcel

this value. Whether MNOs can achieve this or not is followed closely by the telco industry, with all eyes on the potential listing of Vodafone's European towers, Vantage Towers, which plans to initiate an IPO in early 2021. Potential investors will assess whether Vantage has similar value creation capabilities beyond the perception of neutrality that an independent TowerCo has, e.g., through future inorganic growth thanks to the MNO's other portfolio, or if other services will be offered to tenants that are Vodafone's competitors.

Market recognition of independent TowerCos is the result of both a long period of low interest rates and a very attractive model to invest in, given the asset that is being purchased and its reliable return structure. Even now, in the COVID-19 crisis, central banks are committed to maintaining the low-interest-rates paradigm, which makes investments in businesses with long-term, secured and recurring revenues such as TowerCos even more attractive.

Due to its neutrality, the TowerCo model offers additional benefits to its MNO clients, as it opens up the prospect of increasing value through synergies, network densification (BTS programs), economies of scale and operations efficiency, as well as new business opportunities beyond the traditional model.

Beyond the TowerCo model

Looking forward, the model allows TowerCos to expand their services in the infrastructure market. Traditionally, the model has evolved from providing hosting and build-to-suit options to their anchor clients, to offering the infrastructure to third-party clients and including fiber backhaul. This has been the model traditionally followed by the American REITs (the "Big Three": American Tower, Crown Castle and SBA). Later on, and by leveraging master service agreements (MSAs), industrial players such as Cellnex have, thanks to their technical expertise, included new services such as network coverage commitments and monitoring and service assurance offerings, thereby becoming key service providers. This flexibility and these added-value services have been crucial in the last years, since the development of the market has not only increased tower prices, but also raised the expectations from MNOs in terms of buyers' capabilities. Today, however, TowerCos are looking at new potential paths of growth.

One potential path would be entering the active infrastructure layer, becoming a "full" NetCo and providing a new set of added-value services to the market. This concept is not new, but after a long phase of theoretical discussions, it is now becoming more concrete. MNOs are starting to introduce active equipment in their carve-outs, with the acquiring TowerCo assuming its management. This could represent an interesting and quite attractive opportunity for TowerCos, particularly as mobile sites become more valuable as they start hosting edge computing equipment aimed at delivering IoT or smart city low-latency use cases, which will be a significant growing market in the coming years.

Following another path, they could expand their scope horizontally and enter new asset classes where the TowerCo business model is applicable. Having started to offer backhaul services leveraging fiber-to-the-tower (FTTT), TowerCos are finding expanding into different fiber assets an attractive

opportunity. The market development carried out by Altice with MEO's FTTH network in Portugal serves as example of the dynamics that could enable the TowerCo move into fiber infrastructure. When Altice sold the FTTH network of MEO, it devised a right-of-use/IRU model for future clients of the asset, including MEO as anchor tenant and thus lowering the risk for buyers of the infrastructure. The result was a model that could allow a prospective TowerCo to run an asset of the same scale as the FTTH infrastructure in Portugal.

Whatever the evolution of the tower market might be, there is no question that TowerCos will continue developing new concepts in adjacent, nontraditional domains to assure future growth.

Telco asset reconfiguration is looking into more comprehensive situations

In our 2016[19] report on strategic telco reconfiguration, we identified six major classes of assets for which the maturity of reconfiguration varies:

- The TowerCo model has been around for over a decade and is now a commonly adopted model, as described above – most operators have already done so or are actively pursuing it.
- Reconfiguration of legacy fixed network: In combination with the development of next-generation access (NGA) networks, companies have been inspired by the example of the split of New Zealand's Chorus and Spark in 2011, followed by the Czech CETIN/O2 split (2015), and more recently, TDC/Nuuday (Denmark, 2019) and Telenor infra/Telenor Norway (2019/2020). In 2020, many telecom operators told us that the reconfiguration topic was on their boards' agendas, with transactions being considered.
- Over the last couple of years, FiberCos have been gaining substantial traction, providing non-integrated telecom operators with the opportunity to close the gap with integrated players and be on par in a fixed-mobile convergent market enabled by NGA networks. Most are driven by open-access fiber network initiatives promoted by challengers and infrastructure funds (e.g., Open Fiber in Italy, Deutsche Glasfaser and Inexio in Germany, CityFibre in the UK, the Vodafone-backed JV Siro in Ireland, SFR-FTTH in France in 2019). Several transactions have also involved incumbents: for example, TIM, as the largest incumbent globally carving out its nationwide passive secondary – mostly copper – network infrastructure into FiberCop (with KKR as its financial partner owning a minority stake of 37.5 percent) to create an asset vehicle that can finance a nationwide fiber rollout by itself; Altice Portugal selling 50 percent of its FTTH network to Morgan Stanley; and Singtel selling 75 percent of its stake in Singaporean open-access fiber network Netlink through an IPO in 2017.
- Mobile radio access network Companies, or RANCos, are increasingly being negotiated, pushing further the boundaries of asset reconfiguration. Deals are mostly still in the making, with only a few public announcements so far. For example, Belgian incumbent Proximus and Orange are resuming their preparation of the JV MWingz, which should combine TowerCo with RANCo. Most 5G-based network sharing pursued by MNOs is through so-called "non-stand-alone" 5G deployment, thus it is closely coupled with their existing 4G RAN assets. Hence, any asset reconfiguration involving 4G RAN will also impact future 5G deployment.
- Finally, investors and infrastructure companies are looking towards edge data centers as the new growth area for asset reconfiguration.

For those integrated players that have thus far not pursued any of these reconfigurations, the starting point can be very different, and the key issue is to correctly identify the assets that have lost or are losing their strategic differentiation potential. Precedents show a variety of options for the demarcation between the NetCo and the ComCo dependent on the local market context. For example:

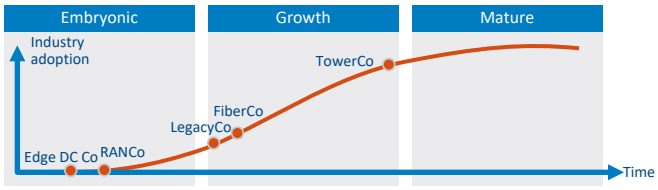
- The position in the next generation network investment cycle.
- The level of integration of fixed and mobile networks, systems and operations.
- The uniqueness and strategic value of network infrastructure (including ducts, street cabinets, dark fiber, mobile towers, RAN and small cells, spectrum, coax network, etc.).
- The dynamic of the retail market, i.e., the number and nature of potential wholesale tenants.
- The local regulatory framework.

It is not only traditional incumbents that are facing the asset reconfiguration challenge. Asset reconfiguration is also increasingly being envisaged by cable operators, which need to consider how to best unlock value from their upgraded cable networks as their competition rolls out FTTH. StarHub in Singapore was forced to rapidly reconfigure its fixed residential operations into a ComCo as infrastructure competitor Netlink deployed FTTH, and in 2017, it became a truly neutral open-access network provider.

19 Major strategic choices ahead of Telcos: Reconfiguring for value, www.adl.com/StrategicChoices

In early 2020, Belgian incumbent Proximus publicly announced the creation of an open network business unit open to co-investment from competitors. At the same time, leading cable operator Telenet entered negotiations with a local utility company to roll out FTTH across its current footprint. This situation could result in a fundamentally reconfigured asset landscape in Belgium. The same discussions are currently happening at board level in many companies across the globe, with management teams and board members considering more comprehensive asset reconfiguration deals involving multiple players.

Figure 61: Adoption of reconfiguration models



Source: Arthur D. Little analysis

Figure 62: Selection of recent FiberCo deals

Country	FiberCo name	Year[1]	Ownership	EV/ EBITDA
IE	Siro	2015	Vodafone (50%), ESB local utility company (50%)	n.d.
IT	Open Fiber	2017	Enel (50%), CDP Equity (50%)	10–25x
SGP	NetLink	2017 (IPO)	Singtel (24.8%), public markets (75%)	15–20x
DE	Inexio	2019	EQT (75%)	≈20x
DE	Deutsche Glasfaser	2020	EQT (51%), OMERS (49%)	≈20x
UK	CityFibre	2017	Antin-IP, West Street IP – Vodafone as anchor tenant	n.d.
FR	SFR FTTH	2019	Altice (50+%), Allianz, OMERS, Axa	15–20x
FR	Covage	2019	SFR FTTH (100%)	≈25x
PT	Altice Portugal FTTH	2019	Altice Portugal (50+%), Morgan Stanley (49%)	≈20x
IT	FiberCorp	2020	TIM 58%, KKR 37.5%, Fastweb 4,5%	≈8.5x[2]

Source: Company information, Arthur D. Little analysis
[1]year of creation or carveout [2] based on 2021 EBITDA forecast

Reconfiguration value creation drivers are multiple and need to be tailored to the situation

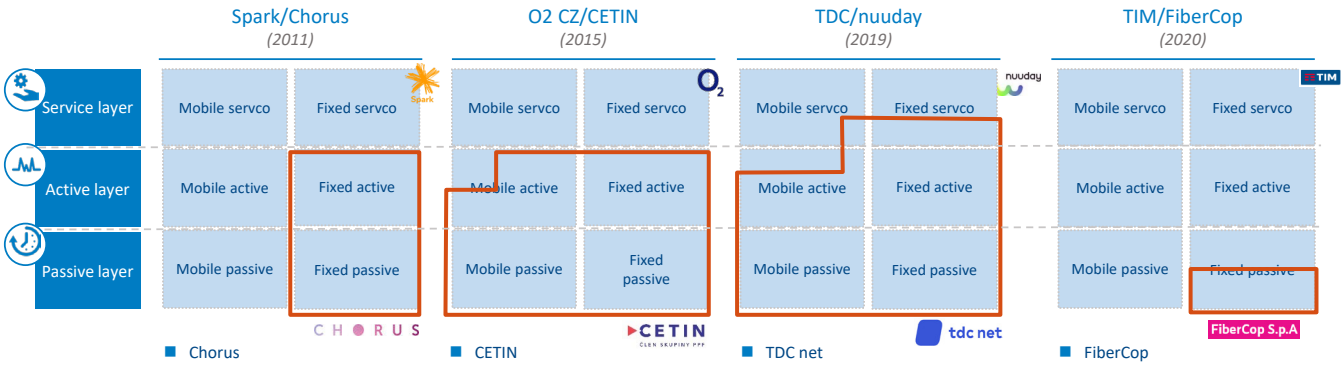
Telco asset reconfiguration can unlock value creation in six ways: accelerating fiber and service deployment by lifting financing constraints, increased asset utilization, de-risking investment, strengthening the wholesale value proposition, increasing management focus on distinct core businesses, and possibly preempting unfavorable regulatory decisions. While several of these benefits can be achieved through network-sharing agreements or internal governance changes, asset reconfiguration offers a springboard to capture all these benefits. However, asset reconfiguration also has its own challenges, and the value creation equation needs to be carefully assessed based on the specific market context of each telco.

Asset reconfiguration value creation drivers

1. Lifting the capex/sales ratio constraint

Most telcos are currently still perceived and valued as yield stock, with strong expectations in terms of stable and generous dividend policies. However, the reality of the industry has been profoundly modified over the last decade, requiring massive investment to deploy NGA networks (e.g., FTTH, FTTO, 5G) with limited and uncertain monetization. The expectation of capex/sales ratio staying in a 15–20 percent range is therefore becoming a key constraint for most operators. The imperative for existing telcos to accelerate their NGA network deployment comes from:

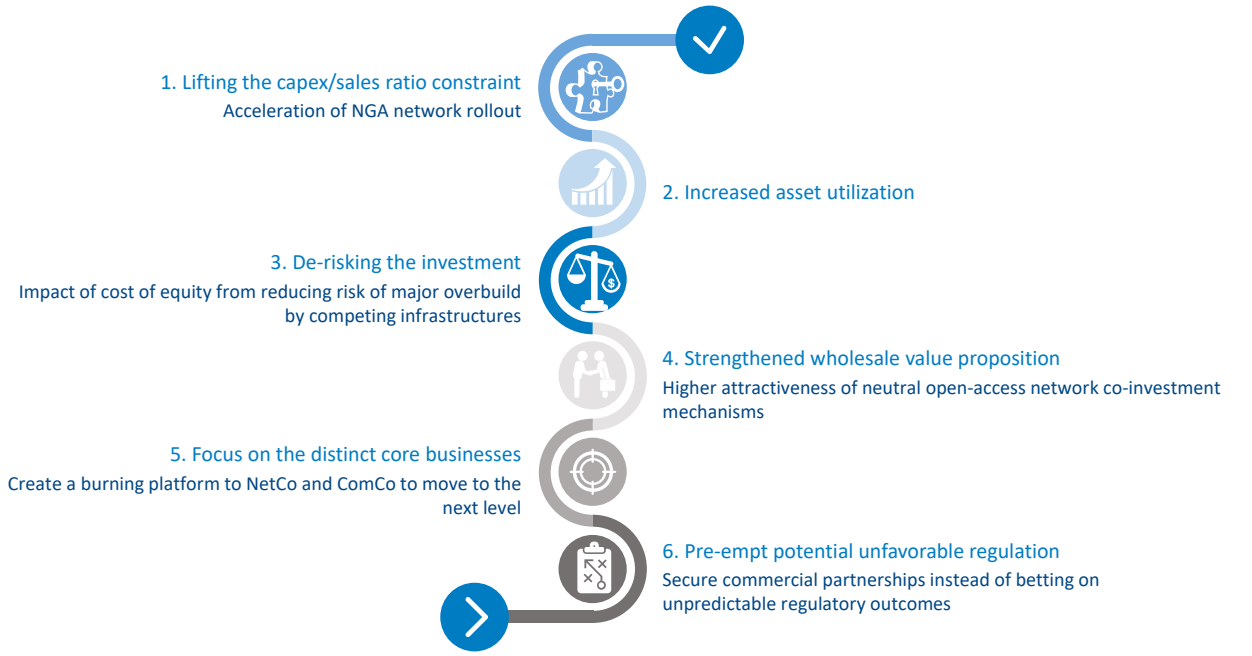
Figure 63: Reconfiguration precedents show a variety of demarcation lines specific to the local market context



- Chorus
  - Copper and fiber access networks (OSI layer 1 & layer 2, i.e., provision of bitstream services)
  - Mobile fiber backhaul
- Spark
  - Service layer
  - Mobile network and active layer
  - Backbone & aggregation networks
  - Reacquired B2B fiber infrastructure
- CETIN
  - Fixed and mobile access networks (active & passive)
  - Data center infrastructure
  - IP core platform
  - Active layer, except spectrum & mobile core
- O2 CZ
  - Service layer
  - Mobile spectrum & mobile core
- TDC net
  - Access network fiber, cable, copper
  - Mobile network, including spectrum
  - IP/mobile core platforms
  - CPE & customer installation
  - Wholesale FBB, FV, int'l capacity agreements, national roaming
- nuuday:
  - Service layer
  - Wholesale mobile services
- FiberCop
  - Passive fixed-access secondary network (street cabinet excluded)
- TIM
  - Service layer
  - Active layer
  - Network layer except passive secondary-access network

Source: Publicly available information, Arthur D. Little analysis

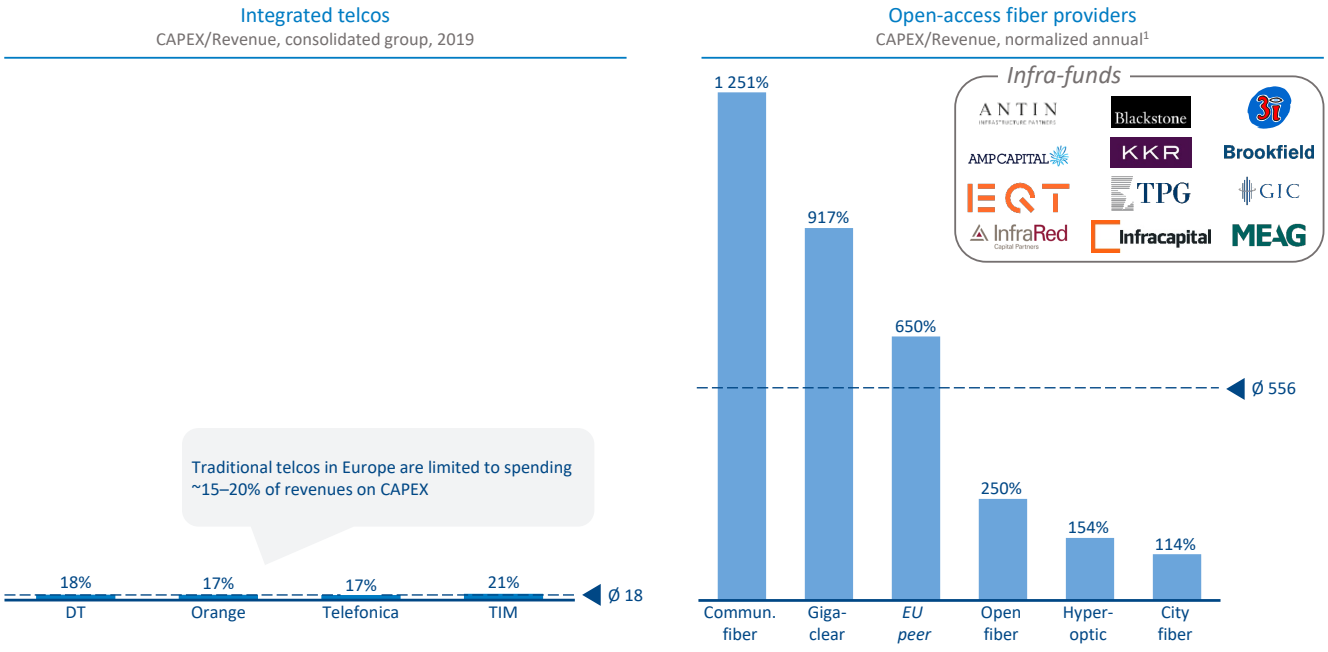
Figure 64: Reconfiguration value creation drivers



Source: Arthur D. Little analysis

- Competition from alternative NGA networks:
  - Infrastructure funds are pouring substantial funding into greenfield open access networks that are challenging incumbent network operators, e.g., OpenFiber in Italy, Deutsche Glasfaser, CityFibre (UK).
  - Telco challengers are partnering with utility companies and investment funds to take the lead, e.g., Siro in Ireland (a JV between Vodafone and a utility company).
- Competition from cable operators (in markets where they are present) that have been upgrading their networks to Docsis 3.1, enabling speeds above 1Gbps and substantially outperforming xDSL.
- First-mover advantage in locking in tenants (see more below under "Strengthening the wholesale value proposition"), particularly when tenants roll out their own active layers.

Figure 65: CAPEX/Sales ratio challenge faced by integrated telcos



Source: Public data, Arthur D. Little analysis
1) Year 3 of forecast for planned projects or last actual for realized projects

In recent years, operators have been looking at achieving off-balance sheet financing via partnerships with infrastructure funds, with a call option to regain majority control at a later stage. Altice Europe has been following this path in Portugal and France (via SFR FTTH and Covage). More recently, Proximus, the Belgian incumbent, announced in 2020 two deals to accelerate the deployment of FTTH in Belgium with Antin IP-backed Eurofiber and EQT. The deal with Delta Fiber, of which Proximus owns 49.9 percent, will cover 1.5m households, while the deal with Eurofiber covers 0.5m households. In total, Proximus will cover nearly 70 percent of the country, close to half via its two infrastructure partners.

2. Increased asset utilisation

From an infrastructure management perspective, a NetCo will aim at maximizing the utilization of its network by attracting new tenants.

In most markets, the combination of local purchasing power and network deployment costs dictates that an FTTH network achieves a penetration level of at least 30-40 percent in order to make the expected return on investment (with a debt/equity ratio of 4 to 1 and a cost of equity of 9-13 percent). For incumbents, the equation is even more difficult, as they face cannibalization of their existing xDSL customer bases. Therefore, few operators can afford for their own retail entity to be the only one on the network. Incumbents, whose retail-driven penetration of their NGA networks has already reached the profitability threshold mentioned above, still face the challenge of further increasing their retail market share as they are confronted with their "fair market share". Either competing retail operators will have access to alternative networks (and thereby improve competing networks' economics), or regulators will intervene and impose regulated wholesale access. In all cases, there is a point at which attracting new tenants to the network will create additional value.

Obviously, network-sharing deals can capture a large part of these benefits without real asset reconfiguration. Network assets are also being selectively mutualized between operators. The difference with the asset reconfiguration model lies in the objectives of the NetCo (maximizing the utilization by attracting new tenants) and its governance.

3. De-risking the investment case

A key benefit of setting up a neutral open-access NetCo is the de-risking of the investment profile, i.e., reducing the cost of equity. The lower-risk profile comes from the lifetime value of the asset, its replicability, and the long-term nature of its contracts as opposed to retail market dynamics. Furthermore, by ensuring a neutral open-access NetCo, the risk of major overbuild is often reduced as retail competitors lose their imperative/incentive to deploy competing infrastructure. The decreased risk of infrastructure competition can translate into a cost of equity closer to 8-9 percent instead of the 12-14 percent in a more competitive environment.

4. Strengthened wholesale value proposition

For decades, telcos have been providing wholesale network services to retail competitors. For fixed networks, the process has usually been driven by regulation, given the monopolistic nature of most copper networks. In the mobile sector, the MVNO economics have been mastered for a long time. Asset reconfiguration enables traditional wholesale models to move to the next level, as it allows the set-up of open-access networks that are perceived by potential tenants (competitors) as being neutral and non-discriminatory. Additionally, asset reconfiguration enables stronger partnerships to lock in tenants via co-investment mechanisms.

5. Increased management focus on the distinct core business

Most integrated telcos have their governance designed to optimize an integrated business model, i.e., promoting the preferred collaboration between the network operations and the retail operations. Management's objectives and incentives, as well as network-retail interfaces, are too often not as sharp as they should be to maximize value creation, and conflicting interests are too often addressed without taking bold measures that would benefit the overall company. Telcos have always struggled to reconcile maximizing network utilization with extracting value from customers. Network operations are undergoing a major investment cycle in which co-investment and/or open-access models become the norm, while retail operations need increased focus to keep and increase their relevance to end users. While governance changes, such as setting up distinct business units that deal at arm's length with competing network and retail operators, can address these challenges, a structural asset reconfiguration will provide a burning platform that forces network and retail operations to reinvent themselves around their core businesses.

6. Pre-empt unfavorable regulatory decisions

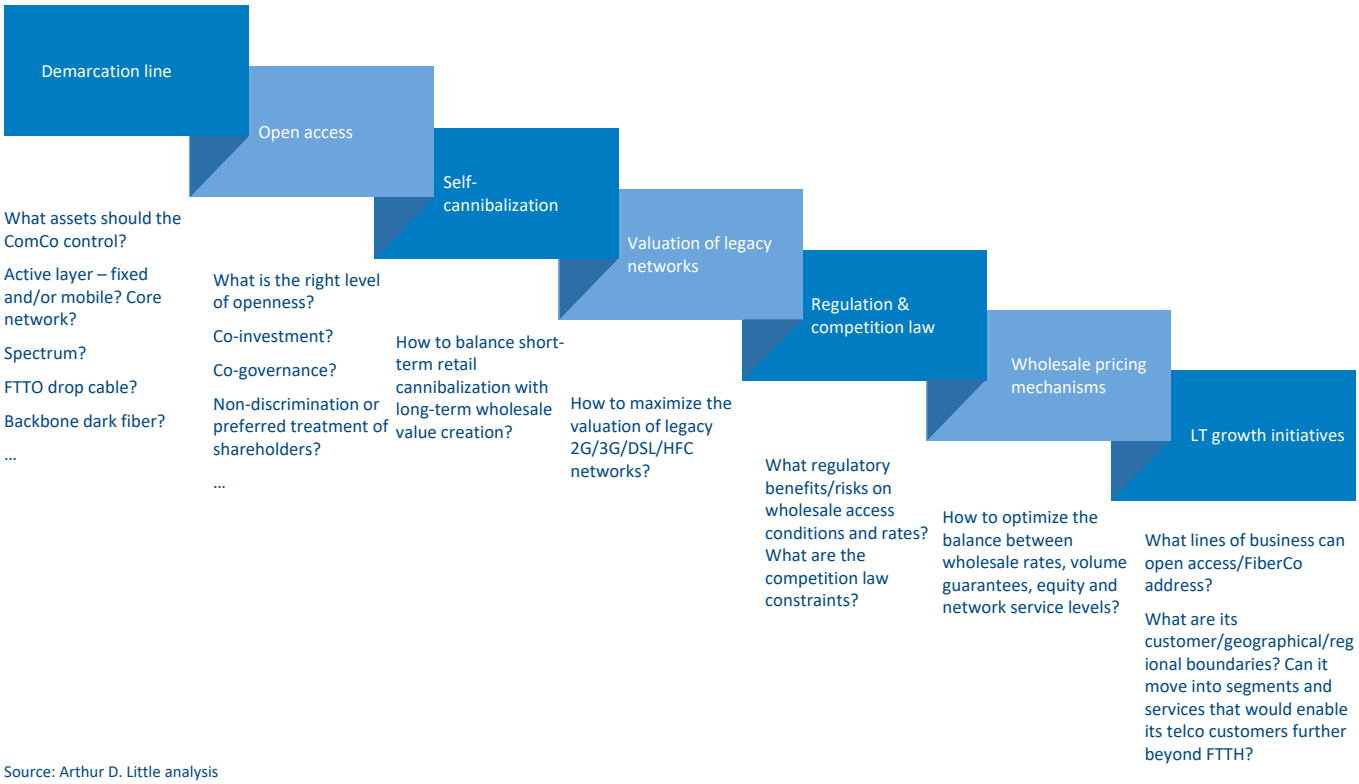
Depending on the regulatory context of the market, telcos may consider setting up commercially driven partnerships rather than betting on the outcome of often-unpredictable regulatory decisions on the conditions and rates of wholesale access to their (fixed) networks. Preempting such regulatory risk contributed to the rationale behind the CETIN/O2 CZ split in 2015.

Substantial value creation can be unlocked, but asset reconfiguration also requires managing delicate balances

The local market's competitive and regulatory dynamics can have a substantial influence on the deal levers that can sway significant value. Many trade-offs must be addressed to make a deal possible and optimize the value split between involved partners:

- Demarcation line – what key assets to control as ComCo:
  - What assets are still providing strategic differentiation value? For how long? As a default position, the ComCo should keep control over the ability to configure its product and service portfolio and secure the lead in network-capacity arbitrations. At the very least, core network and spectrum should stay with the ComCo unless outweighed by substantially higher value creation at the NetCo level and faced with a limited retail risk.
  - What are the levels of dis-synergies of carving out NetCo operations, i.e., at OSS and core network levels, or for fixed-mobile integrated operations?
- Level of openness of the NetCo:
  - Should an equity stake be offered to secure major tenants in a market with only a few retail service providers?
  - What contractual rollout and SLA levels should be formalized and offered to the ComCo?
  - Should all NetCo services and products be accessible to all tenants? Or should some be accessible exclusively to shareholders, e.g., backbone dark fiber?
- Self-cannibalization dilemma:
  - How to overcome the "self-cannibalization freeze", i.e., delaying the decision to minimize cannibalization and thereby missing the "reconfiguration opportunity window"?
- Valuation of legacy network:
  - How to monetize legacy networks (2G/3G/DSL/HFC) during partnership valuation discussions – the operational network infrastructure and the customer base on it?
  - How to optimize the decommissioning of legacy networks while NGA networks are being rolled out by the NetCo?
  - What is the optimal migration path from the legacy network to the NGA network? How should the NGA build-versus-migration risk be translated into an MSA?
  - From a valuation, governance and marketability perspective, should the legacy network be in a separate NetCo or part of the NGA NetCo?

Figure 66: Reconfiguration challenges to be addressed



Source: Arthur D. Little analysis

- Regulation & competition law:
  - What are the constraints of the regulatory framework and the risk attached to remedies, e.g., on overbuild conditions (mandatory duct/trench/site sharing), and on wholesale access conditions and/or rates?
  - How feasible are partnership reconfiguration options from a merger-control/competition-law perspective?
- Wholesale pricing mechanisms:
  - How to formalize the risk-value balance between actors that have equity stakes and/or are tenants of the InfraCo in the shareholder agreement and MSA?
  - What are the adequate wholesale pricing mechanisms (minimal volume commitments, [time-bound] exclusivity, volume discounts, pricing of drop cable installation, etc.) to balance the regulatory and competition law constraints, the attractiveness of the wholesale offering, and the potential value leakage to other tenants?
- Long-term growth value-accretive initiatives:
  - What lines of business can open access/FiberCos address? What are the customer/geographical/regional boundaries? Can they move into segments and services that enable their telco customers beyond FTTH?

The complexity of combining these trade-offs explains why optimal outcomes might vary significantly from market to market.

Shareholders beware: Telcos are shifting from yield stocks to infrastructure-rollout stock and growth stocks

Telcos have traditionally been valued as yield stock with stable returns and dividends. However, two major trends are reshaping the industry: (1) Deployment of FTTH and 5G has triggered the need for investment from private actors at a level never seen before in the industry, and (2) The convergence of industries has enabled retail players from adjacent sectors to claim (part of) the revenue and margin upside potential unlocked by FTTH and 5G.

Network operations cannot sustain the current yield-stock profile; the current growth of alternative networks being rolled out with the support of infrastructure funds proves that. Fundamentally, the cash flows of network operations will have to be isolated (i.e., deconsolidated) and match the investment profile of greenfield infrastructure investments, namely, massive upfront investment followed by a stable yield over the long term.

Furthermore, the increased transparency of the ComCo business model will force the ComCo to clarify the investment case to its shareholders and investors. With no (passive) network, the ComCo will have to justify its capex level and therefore face a choice:

- Become a growth stock: focused on reinventing the customer experience, e.g., by incubating multiple new businesses and exploring partnerships in non-core areas. A clear digital-growth strategy focused on securing and monetizing customer ownership will be needed to justify the investment required to build the digital and ecosystem management capabilities that telcos currently lack.
- Remain a yield stock: continue to improve the performance of retail operations by becoming a lean, no-thrill ComCo focused on legacy customer segments, which, hence, justifies limited capex.

Conclusion: Time to accelerate growth through asset reconfiguration

As the telecom industry goes through a disruptive and transformative phase, various strategic responses are possible. While 5G is opening up new opportunities to invest in and grow core services, there are also a number of viable diversification opportunities beyond the core. In parallel, asset reconfiguration is no longer just a way to raise funding, but can also create a platform to pursue new growth options.

Choose 5G value creation opportunities that best fit existing strengths

5G presents multiple value creation opportunities, but not all telcos can practically pursue every opportunity. Options should be evaluated against the telco's inherent strengths, its ability to roll out the necessary infrastructure, and the market situation. 5G is driving B2C convergence faster than any previous mobile technologies, giving mobile-only players an ideal opportunity to expand their fixed presence. Telcos can also go beyond connectivity in B2B markets by offering industry-specific 5G solutions, though they need to acquire relevant domain skills to do this. 5G wholesale opportunities are suitable for telcos that favor an asset-heavy, long-term gestation approach to their businesses. Identifying the right growth opportunities and appropriate asset configuration is the key to success.

Pursue beyond core opportunities with a start-up mind-set

Pursuing opportunities beyond the core is not new for telcos, but finding a successful model that can also be scaled up has proved elusive. Adopting a start-up mind-set to seek out new opportunities, while at the same time running an entrenched, asset-heavy traditional connectivity business, is difficult. However, by creating a clear diversification plan that takes a multi-modal approach, combining internal and external resources (including partnerships for skills and appropriate funding), and that targets sizable potential revenues, significant results can be achieved.

Explore asset reconfiguration not just to raise funding, but also to recapitalize

Telcos should consider asset reconfiguration not only to raise funding for 5G and diversification opportunities, but also to find the right balance between shareholder expectations and the risk/return potential of the future telco. Multiple telecom operators in Europe and elsewhere are actively considering carve-outs/spin-offs of parts of their networks, some to raise funding for fiber or 5G roll-out, and others to adjust their capital structure. Finding the right asset and capital structure is vital to ensure successful value creation.

Identify a reconfigured asset structure that best enables 5G and beyond core opportunities

Both shareholders and management of telcos should carefully consider their vision for the future, and correspondingly pursue the right 5G value creation opportunities and the right partnership structure. Achieving growth beyond the core requires appreciation of start-up-related risks, plus reconfiguration of asset ownership and capital structure. This will provide a solid and sustainable platform from which the telco can achieve its vision.

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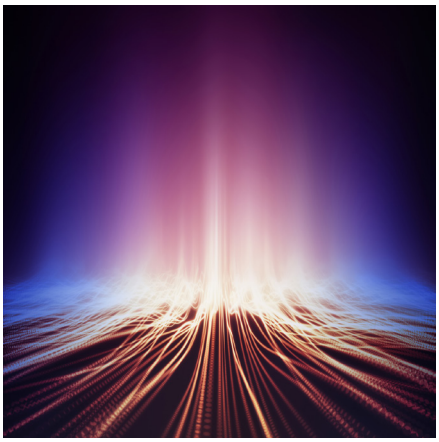

Time to accelerate growth

How telcos can fuel growth via 5G and diversification

TIME global report

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